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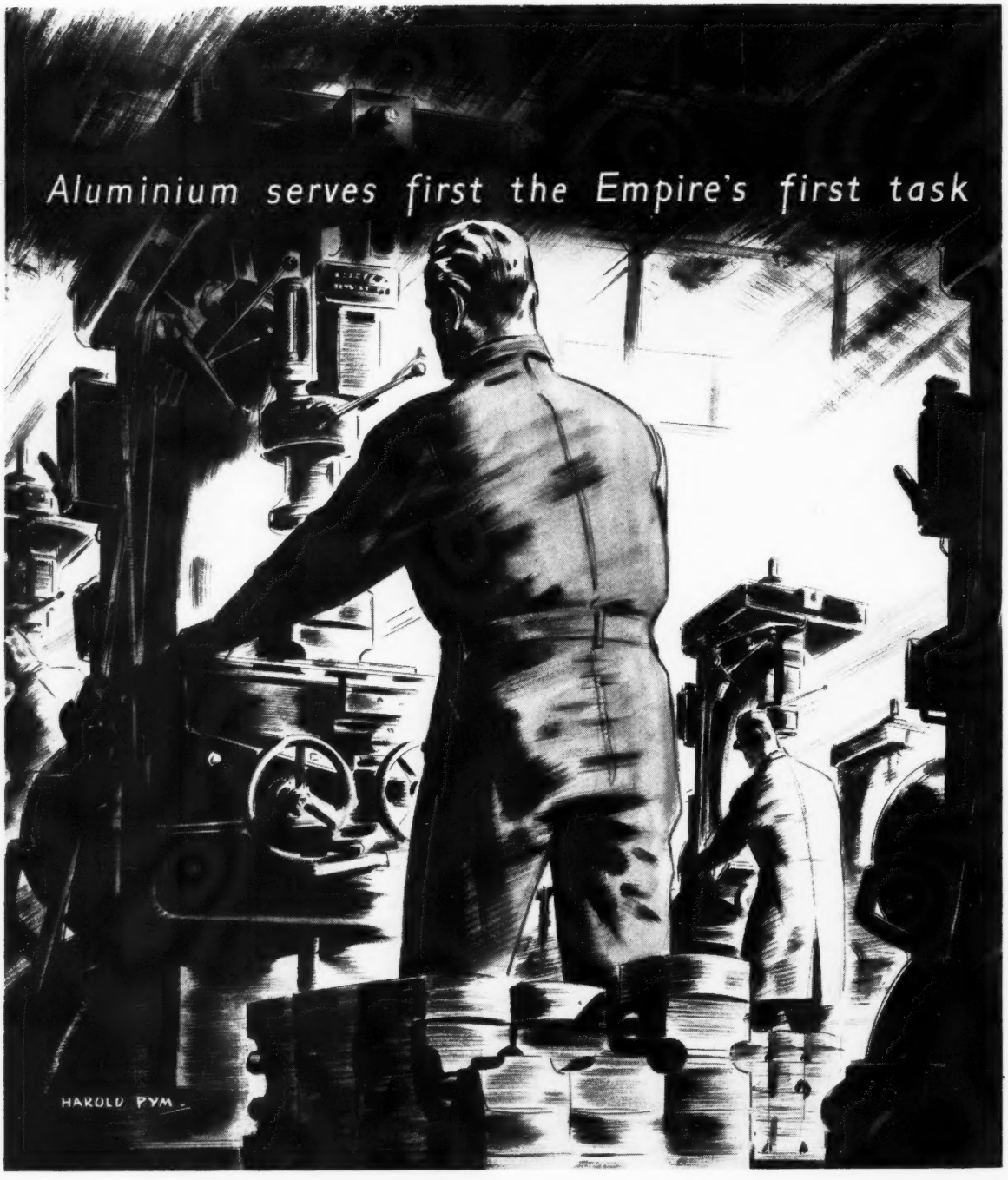

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THE ELECTRICAL REVIEW

Volume CXXVIII — No. 3287

Friday, November 22nd, 1940

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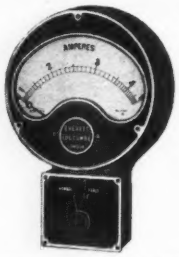

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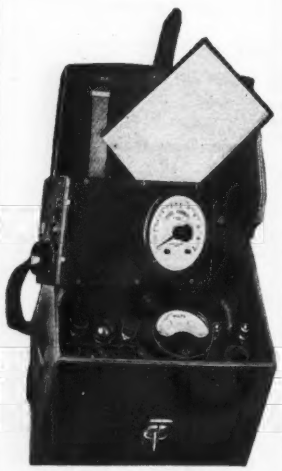

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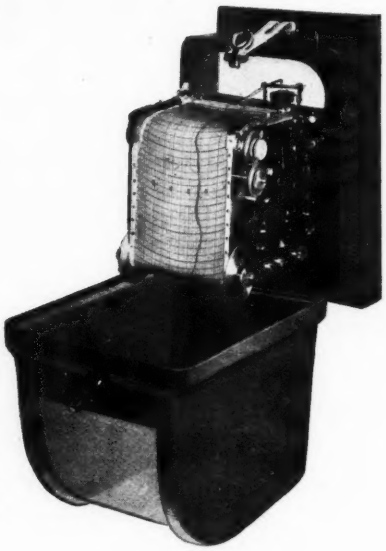

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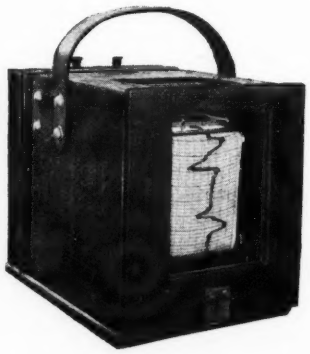

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THE
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3287 NOVEMBER 22, 1940 Price SIXPENCE

Wartime Industrial Tariffs

Influence on Load Building

IN conducting an investigation into special aspects of industrial tariffs, such as that which has resulted in the article on page 53, it becomes evident that certain points which might be considered commonplace require some emphasis. Does industry appreciate that charges now being made for electricity are low and that generally they have been increased only very slightly above the peacetime level? It is true that the greatly increased revenue from munitions production has contributed to this, and that the effect of the much longer working hours of the factories is to reduce the costs per kWh. We believe, however, that the public is now getting the benefit from the conservative policy of the supply engineer. If this is so, then we shall again be favourably placed after the war when that difficulty of adjustment to a correct figure (which always arises when temporary conditions enable supplies to be given at specially low rates) will already be, at least partly, solved.

Many consumers have had to take supplies during the war without time for negotiation, with the result that there has been some intensification of the usual suspicions and doubts, and it must be admitted that many of these doubts are really quite natural. It is not easy for the uninitiated manager of an engineering shop for which the load factor cannot be predicted, to see why a neighbouring spinning mill, the load factor for which can be closely estimated, should have more favourable rates.

Frank Explanation

It is also understandable that the works manager should be perturbed when he is confronted with agreements involving quantities which cannot be measured. What really is average load factor? Then, of course, there is the almost natural dislike for any maximum-demand charge. The point we want to emphasise, however, is that where there is good will the problem is more than half solved at the outset, and we cannot stress too forcibly the necessity for frankness towards the consumer on the part of the supplier. What point is there in concealing details of how a fixed charge is arrived at? With frankness, and recognition of the fact that it is easy to interpret the meaning of an agreement beyond the original intention, it is much simpler to appreciate that complicated contracts and metering are not the end but merely the means.

Support for these contentions lies in the fact that nearly always when complicated metering goes wrong there is little or no difficulty in getting the consumer to agree to a reasonable figure for past electricity consumption.

Fair Allocation of Costs

A great deal of the importance of almost any tariff lies in its possible influence on load building. We show in our article how, by the allocation of the various costs of the undertaking to its consumers, individually perhaps in the case of very large consumers and certainly collectively for classes of small consumers, fairer tariffs can be established on which different kinds of load can be built. Much necessary information about the consumers' operations is needed before such allocation can be applied effectively and no doubt in many cases the actual collection of such information must be replaced by intelligent guessing.

Can we afford to overlook the demand that there shall be one electricity price for all? Until electricity supply has progressed to that point of popularity at which human nature will become tolerant towards charging and metering, scientific principles will continue to be the means for commercially moulding tariffs if we are to keep abreast of the opportunities which load building, as distinct from mere salesmanship, provides for the advancement of the electrical industry.

We must continue to strive for a better appreciation of the principles of true load building, and it is in connection with tariffs as much as with any other aspect of electricity supply, and probably more so, that the oft-repeated contention of the ELECTRICAL REVIEW is justified; namely, that only on what is still to-day a somewhat rare foundation, with the right quantities and qualities of commercial aggregate and technical cement, can an effective load-building structure be

erected. In these considerations, however, there is much to be said for the sliding scale tariff so successfully in operation in different parts of the country. While the high kWh charge on the lower consumptions seems to line up reasonably well with the fixed charge demands, the principle of " the more you buy the lower the price " is so well ingrained in the human mind. But it is not our object to advocate any one particular tariff: rather do we wish to assist in clarifying some of the many obscurities brought about partly by to-day's peculiar conditions and partly by a little over-zealousness in the treatment of the principles of the scientific tariff by some undertakings when dealing with consumers.

" Bloody but Unbowed "

WE have already commented upon the way in which electricity undertakings are maintaining the supply in spite of the enemy's air activities and rapidly making good any damage which may be done to their property. A similar spirit is being manifested in the manufacturing and commercial branches of the electrical industry. They are taking their knocks with an admirable *sang froid* and carrying on in their battered premises or rapidly transferring their business to other districts. In all this they have been greatly assisted by the patience and forbearance shown by their customers. In fact all parties have steadfastly refused to be rattled by these aerial visitations and have thus deprived them of half their sting.

Power Station Design

DISCUSSING the practicability of evolving standard designs for power station equipment in the United States, the *Electrical World* comes to the conclusion that in face of increasing coal prices and technical progress, such an outcome is unlikely until the present trend in development has run its course—if, indeed, that ever happens. Similar considerations have force in this country where, however, some measure of standardisation has been achieved under the influence of grid working. As was shown in an article which appeared in our issue of June 14th, most of the turbo-alternators installed during the last few years have been 30,000-kW, 3,000-RPM machines usually designed for steam conditions of about 650 lb. per sq. in. and 825 deg. F, and these suit the circumstances here very well. Flexibility for technical progress is, nevertheless, provided by a number of large stations employing sets of greater output and more advanced steam conditions. These are situated in dense-load centres and from the nature of the duties required of them they are operated in a somewhat similar manner to stations working under independent control.

Manufacture in New Zealand

COMMENTING upon the development of manufacturing industries in New Zealand, the Wellington correspondent of the *Chamber of Commerce Journal* mentions electric cooking ranges and dry and wet batteries as two classes of goods which are being produced to an increasing extent in the Dominion. As we have pointed out in these columns, the position is not a satisfactory one from the United Kingdom exporters' point of view. The correspondent says that local houses engaged in importing or representing British export organisations fully realise the need for Great Britain to maintain and extend its export trade if only as an offset to the heavy purchases made in New Zealand of wool, meat and dairy produce. " In present circumstances, in New Zealand, it would appear to be difficult to harmonise the export policy of the United Kingdom with the import restriction policy of the New Zealand Government." In another part of the same issue of the *Journal*, however, Mr. Walter Nash, New Zealand Minister of Customs, says that it is the desire of his Government that the maximum of the Dominion's requirements shall be obtained from the United Kingdom and that every endeavour will be made to achieve that purpose. This is later qualified somewhat by the proviso " insofar as the funds available permit of imports being made and British manufacturers are in a position to supply the goods required."

Shelter-Wiring Deaths

WE continue to receive reports of fatalities caused by faulty installations in air-raid shelters and it is clear that they are assuming a serious character. The general warning issued throughout the Press of Great Britain by E.D.A. and the public notices made by the electrical engineers of a large number of undertakings have no doubt had a good effect but it would seem that something more is needed. We consider that there should be an absolute ban upon the connecting-up of electrical installations in shelters until they have been passed as safe by a competent inspector. Moreover, we doubt whether any installation in an Anderson shelter can be considered safe at normal voltage and we are inclined to agree with the borough electrical engineer of Woolwich that very low voltages should always be employed in these shelters; transformers are available at comparatively low cost.

Cold Light

OFTEN the firefly has been held up as a model producer of light, because the visible radiance which it emits is not associated with invisible ultra-violet and infra-red energy. This light is, therefore, relatively cool, indicating high luminous efficiency (although in converting " fuel " into light the efficiency is poor), and its wavelength is near that at which the human eye can make the most of it, viz., 5,550 Au. However, the lighting, being of a green-yellow monochromatic colour, is unsuitable for most purposes and for practicable requirements something is called for more nearly approximating to outdoor noonday conditions with a colour temperature of 6,500 K. If all the energy supplied were radiated in the visible spectrum with black-body distribution between 4,000 and 7,000 Au, the maximum efficiency would be 225 lumens per watt compared with 621 lumens per watt theoretically obtainable by converting to monochromatic light. Discussing the relative coolness of ft.-candles from various light sources in the *General Electric Review*, Dr. M. Luckiesh and Mr. A. H. Taylor show that natural lighting conditions are closely matched by white fluorescent lamps. As the ft.-candles provided by these lamps are accompanied by only twice as much energy as they would be if obtained from natural light, it is evident that the quest for colder light has made a considerable advance through recent lamp development.

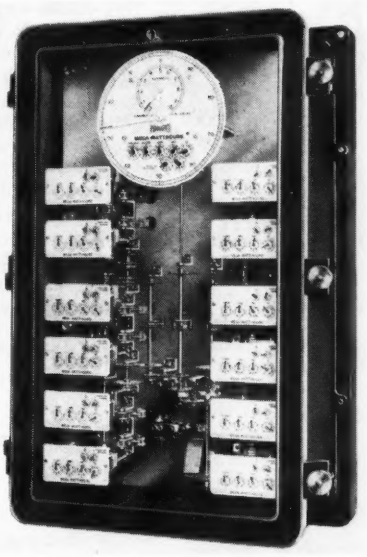
TARIFFS AND METERING

Explaining Matters to the Industrial Consumer

SINCE the beginning of the war we have met many works managers and engineers who, as the result of very rapid factory expansion, have found themselves committed to accepting from their electricity supply undertakings methods of charging and metering different from those which they had become familiar with as comparatively small consumers. Although we have heard nothing in the nature of serious complaints or dissatisfaction, we have certainly found a good deal of perplexity, mainly because of failure to understand the reasons behind the changes in the methods of charging and metering.

The object of this article, which consists of deductions drawn as the result of discussions on the subject with a number of supply engineers and meter manufacturers, is twofold: first, to help works managers and works engineers to understand the reasons underlying the changes, and secondly, to assist supply engineers to appreciate the difficulties which arise in the minds of these consumers. It is first necessary to appreciate that the changes are quite logical in spite of the anomalies which inevitably spring from the many prevailing methods of charging.

It would be quite impossible to detail in a representative way a reasonable number of the conditions and charges which we have in mind, but the sort of thing that happens is that a small consumer who, because of inability to guarantee a certain minimum consumption is charged standard rates (often flat), finds that as a large consumer he is offered an alternative tariff (usually two-part) which is an advantage to him because it means lower charges and an advantage to the supply undertaking because of the larger revenue received. To the trained mind it is simply necessary to point out that the economics of the supply conditions alter when a small consumer becomes a large one, and that diversity of demand is largely responsible for this. But in many cases we are afraid such a bare explanation would not impress the consumer.



Ferranti 12-point summator with m.d. indicator

It is important for all to remember that the consumer, if he is an astute business man and is aware of his ignorance of the subject, will feel sceptical until he is convinced of the straight-dealing of his supplier. It is necessary to point out at this stage that the biggest consumers of electricity in this country have their own special electrical engineering staffs who are thoroughly conversant with the matters under discussion and, indeed, are themselves responsible for much of the complicated metering equipment for which the supply engineer and meter manufacturer are often subjected to criticism.

A difficulty common to many consumers of all classes is the lack of appreciation of the fact that the supply undertaking does not merely sell a commodity, but also affords a service to the consumer. Once this fact is grasped it is a simple deduction that the price of electricity must be related both to the value of service to the consumer and to the cost to the supplier of providing that service. Further, it should be borne in mind that the number of kWh consumed bears little relationship to the cost of providing the actual service or to its value to the consumer. It is often said that the value of an article is what the seller can get for it, and while we cannot accept this in its entirety, it has a close bearing on the subject by stressing the fact that probably every undertaking in this country deliberately overcharges some types of consumer and undercharges others. For instance, public lighting for which the ratepayers subscribe is usually charged for at a very low rate, while transport charges, payable by the passengers, are usually comparatively high.

Another misconception which should be removed in the early stages of discussion relates to the cost of metering equipment. Once this cost reaches three figures it is the subject of all sorts of criticism, although as a percentage of the revenue dealt with the cost is actually lower than that of the metering equipment of the average small consumer. It would be quite uncommercial to spend sufficient money to measure the small consumer's supply with a high degree of accuracy in the sense of charging him for what he buys in the scientific way which becomes possible in the case of the large consumer. The essential deduction from this is that, commercially, the larger the revenue the more permissible is accurate measurement. It is wise to bear in mind that the more complicated metering equipment always carries with it a greater maintenance cost.

Let us try to remove some of the difficulties which the works manager experiences in trying to understand the reasons for the wide divergencies in the details of tariffs. Help in this way can only be given as the result of sympathetic consideration of the perplexity of the consumer with different works all charged at different rates. It is certainly not sufficient to acquaint him with the fact that in spite of the differences in detail the principle of all the tariffs is the same. First of all we must refer to the influence of supply undertakings on the consumer's outlook with regard to metering. We counter the challenge that such influence is a myth by pointing to the fact that it is easy to select one undertaking in this country where only quarterly meters are acceptable by domestic consumers, whereas another undertaking similar in practically all respects finds an almost exclusive call for prepayment meters. One, at least, of our most progressive power companies refuses to accept the principle of rigidity with regard to industrial power charges because of the competition of other forms of power which it meets successfully, whereas similar undertakings apparently find difficulty in departing from standard tariffs.

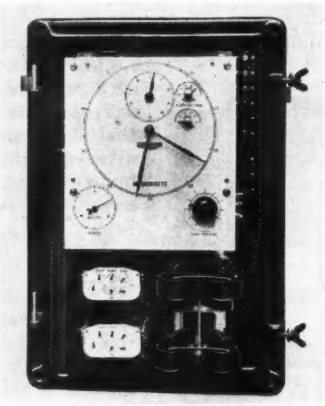
Remoteness or proximity of power stations in relation to collieries naturally has an influence on the coal charges to the undertaking which must be reflected in the price to the consumer. The necessity to put a power station where there are adequate water supplies often necessitates large trunk transmission, the cost of which must again be borne by the consumer. It should not be difficult to appreciate the differences between the cost of distribution in a densely

built-up district and that in a scattered town well provided with gardens like some of our seaside resorts. The smaller the consumer the greater is the part of the cost of supplying him with electricity which is allocated to distribution and overhead expenses.

Because of all these and other reasons underlying tariff divergencies, it is obviously important that serious consideration should be given to the assessment of profits if we are to be reasonably fair to all consumers.

The Two-Part Tariff

Practically all the consumers of the type we hope particularly to assist by this article are concerned with some form of two-part tariff. The essential reason for this tariff is the aim to allocate the fixed and running charges incurred by the undertaking. We know of nothing strictly comparable with the two-part tariff in the commercial world, and the reason for this is bound up with the inability to store electricity. This peculiarity of electricity supply and the reasons that we have already given for the divergencies of tariff details show how inequitable it is to apply a flat rate to all consumers. On the other hand we shall show a little later on why it is so difficult to frame a truly scientific and equitable tariff.



New Metropolitan-Vickers m.d. meter

The two-part tariff is really a compromise between the flat rate and the scientific tariff, and one reason for this is the account which must be taken of load factor. On one particular tariff it is only at an annual load factor of 40 per cent. that the fixed charge, when converted into a kWh charge, is the same as the kWh charge. The smaller the consumer the less likely is the fixed charge to reflect the true relationship between the fixed and running costs. This may be best illustrated by reference to a normal two-part domestic tariff which is permissible only when the consumer installs a cooker. The all-in domestic-tariff fixed charge cannot be more than a compromise because the cost of measuring kW or kVA is too great. Further, rateable value on which this charge so often depends has a connection with amenities and is quite independent of the use of electricity.

It is reasonable to suppose, therefore, that an undertaking quoting a standard charge could hardly know how such a charge was derived. All the same, the compromise does provide a good working arrangement, and maybe the best working arrangement, for undoubtedly the two-part tariff does teach good citizenship in the use of electricity. Our only object in dealing with these domestic considerations is to illustrate more clearly the difficulties pertaining to the standing charge, for in the industrial field a psychological objection to a high fixed charge is so often encountered.

By referring to the conditions of smaller consumers as we have done we hope we have made it clear, first, that there is no such thing as the perfect tariff in the scientific sense and, secondly, that the larger the consumer in relation to the size of the undertaking the nearer can an approach be made to a scientific tariff. In the case of the consumer who takes 25 per cent. of the undertaking's output the error between actual and scientific is probably very small, but even so it may mean thousands of pounds per annum too much or too little. It should be clear, then, that if the kWh charge is directly proportional to the cost of producing the kWh, then the fixed charge becomes so high that no one would accept it. Further consideration along these lines calls for a study of fixed and running costs. Published and generally accepted definitions are " in *running costs* are included all those costs which depend upon the number of kWh sent out from the generating stations " and " costs and charges which depend upon the kW demand made upon the station or on some other factor independent of the kWh sent out are regarded as *fixed charges*."

It is difficult to imagine how an undertaking could be efficiently managed without an accurate analysis of its fixed and running costs and obviously such an analysis must be reflected in the tariffs drawn up by the undertaking. Indeed, such reflection is the essence of all true load-building. There must be a limit, however, to such analysis when dealing with consumers, especially the smaller ones, partly because of the cost involved and partly because adequate information could not be obtained, for to carry the idea to its logical conclusion would involve the impossible task of studying the supply taken by every consumer.

But could we not have some acceptable standard of analysis for application to consumers, so as to avoid discrepancies between one district and another ? For instance, most undertakings consider their consumers in classes, and it seems to us reasonable that agreement should be reached on the constitution of such classes and the method of allocating costs to them. The main considerations in respect of such grouping are load factor and diversity and the load factor difficulty becomes very pronounced where there are standard charges, because of the diversity, due to the different times at which the demands are made. A group of consumers with low load factors individually may have a comparatively high collective load factor merely by reason of diversity, and in this respect we can point to the garage motor which involves the undertaking in service charges beyond those of the ordinary consumer. By reason of diversity, however, 1,000 garage motors mean comparatively low station and transmission charges.

A final word on load factor relates to off-peak charging. Is any tariff reasonable which assumes that a consumer is responsible for no fixed costs whatever ? We might work to the same ends by asking if off-peak tariffs cannot be carried too far, for if all consumers were encouraged to change their working hours the object would be defeated, and is there not a flavour of subsidy here ?

Power factor is another aspect which closely concerns our discussion, but we have recently dealt with this subject exclusively and so comprehensively that we recommend our readers to consider the article in the ELECTRICAL REVIEW of August 16th, in conjunction with this one.

Metering

The object of this article could not be achieved if we did not give greater consideration to tariff problems than to metering, for metering is merely the method of applying the tariff. If we accept the principle that the bigger the consumer the more necessary it is to make the tariff reflect the costs, then we have two major groups of problems to consider : those which involve a change from purely flat-rate measurement to maximum demand measurement, and those concerning the measurement of kVA and/or power factor. Generally it is not worth while measuring kVA up to, say, 200 kW. The principal quantities for measurement then may be reduced to kW, kVA, power factor and load factor. Broadly the cost of measuring maximum demand is too great in the case of small consumers and the cost of measuring p.f. is too great for medium consumers.

In one form or another, however, maximum demand is of paramount importance. There can be no doubt that the principle of striking an average m.d. over a period of,

say, 30 minutes, is fairer than taking an actual peak figure, because a little consideration will show that kW/time expresses the value of heating effect, a factor which concerns both supply engineer and consumer more than any other. The bulk of m.d. complaints that we have heard relate to the choice of period for the m.d. measurement, and we have discerned a particular dislike for a yearly basis. It is easy to understand a consumer's preference for the monthly basis, but if we consider the case of those extremely large consumers where the capital outlay for generating and transmission plant is so great that a working arrangement between the supplier and the consumer would be impossible commercially without a substantial guarantee over a period of several years, then we shall see the yearly demand basis in its truer light.

In drawing up agreements involving such m.d. considerations goodwill between supplier and consumer is of far greater importance than any of the factors which we can define technically or otherwise, and there is no greater justification for that glorious clause " every case to be considered on its own merits."

Forms of Apparatus

Apparatus available for the measurement of m.d. takes the form of an indicator by which any kWh meter can be converted into an m.d. meter, or a combined meter and indicator, *i.e.*, in the case of the separate instrument a single-way contactor added to the kWh meter transmits impulses to the indicator and is operated by the main meter spindle through gearing arranged to suit the required rate of impulse transmission. The smaller of two pointers is operated by the impulses and drives the larger pointer over the scale. The driving pointer is reset to zero at pre-determined intervals, leaving the larger pointer to indicate the m.d. over the chosen interval. In a typical m.d. meter the motor is geared to the driving pointer which, at the end of the required period, will have advanced by an amount proportional to the kWh consumed and consequently to the *average* kW load during that period. An electromagnet disengages the gearing at the end of the period, when the pointer is returned to zero by a spring.

We have become concerned at the lack of appreciation among consumers of the advantages to be gained by applying knowledge of m.d. conditions. It is a matter of extreme importance to the supply engineer, too, for on such application depends the improvement or otherwise of general supply conditions, and in the long run electrical advancement. There are available equipments for giving alarms and for regulating works plant when m.d. conditions are approached, but it is useless to install even the best equipment available unless the works manager is educated to the advantages to be reaped from its installation, and unless his co-operation is assured. The simplest type of limitation equipment consists fundamentally of a robust wattmeter element fitted with contacts which close to operate a timing mechanism which, via other contacts, first ring a bell and later trip the load. Whilst completely satisfactory on steady loads this apparatus is liable to errors on a fluctuating load.

Date of Demand Increase

Giving satisfaction on varying load conditions, another scheme employs a kWh meter system which operates a driving pointer through a set of gears which can be disengaged magnetically at the end of each period; this apparatus is sometimes modified to incorporate a self-resetting alarm contact. Under certain conditions, however, it becomes necessary to measure the rate of increase of the demand, and for such requirements there is apparatus incorporating a special demand relay and a timing relay. Should the load be such that the rate of increase is greater than the standard, a rotating contact causes the first alarm to operate. If, however, the rate of increase is lower than the standard, the rotating contact will not operate before the resetting device. Meanwhile a timing drum governing the alarm circuits slowly turns to impart a correct sequence of operation to an alarm and rotating devices.

A new m.d. meter illustrated consists of two pointers, one driven by a constant, but adjustable, speed motor, and the other by the load itself. The former is adjusted to rotate at a speed equivalent to the desired load. If the two pointers rotate in synchronism, then the actual load is at the required level. Any divergence is immediately shown by the two pointers when the operating engineer can at once observe the actual variation and the balance of the period left for adjusting the integrated energy for the period.

The value to the works manager of a record of m.d. over an operating period need hardly be stressed and must prove an asset in connection with most load-limitation schemes. The printometer, an instrument available for producing such records on a roll chart, is operated by impulses from the two-way contacts of a meter or summator. Each impulse represents a definite value of kWh, kVAh or reactive kVAh. Several inches of chart always remain visible and the demand figures for the past twelve hours can be seen without the chart being unrolled.

Once the fundamentals of m.d. measurement and regulation are grasped there should be no serious difficulties about load summation, bearing in mind, of course, the important fact that, where the maximum demands on a number of feeders are not coincident, overall maximum load is not the addition of the individual maximum load. If arithmetical addition is employed it is essential that the consumer should appreciate the method—indeed the method can only be justified on that score.

Summation Methods

Generally there are four methods of summation: The parallel-current method, which must have current transformers of the same ratio and which becomes increasingly inaccurate as the number of feeders are increased; the split-current winding method in which a meter has its series coils divided into two sections, each of which is connected to one of the current transformers; the summation-transformer method in which the summation current transformers have a number of primaries each connected to the secondary of a current transformer on one of the circuits to be summated (the advantages of this method are that the current transformers can have any ratio and a standard 5-A meter can be used); the fourth method employs a meter on each feeder with impulses to the summator. The summator comprises a number of elements designed to operate from the two-way impulses transmitted by the meter contacts. Through suitable gearing trains both the consumption and m.d. are summated mechanically on a separate dial.

The fifth method employs a double polyphase (four element) meter which can be used to combine the supply along two independent feeders, or it can be combined with the first, second or third methods to meter a load delivered to two separate busbars, provided not more than three feeders terminate on each of the busbars.

For their help in the investigation which led to this article we are indebted to the chief engineers and staffs of the Birmingham, Sheffield, Lancashire Electric Power and Manchester electricity undertakings and to Ferranti, Ltd., and the Metropolitan-Vickers Electrical Co., Ltd.

Tobacco Factory Practice

IN reporting Capt. B. C. Bayley's address to the I.E.E. South Midland Centre, in our November 8th issue, it was stated that air conditioning was responsible for 51 per cent. of the factory's maximum demand, whereas the correct figure is 31 per cent. One new factory requires 433,000 cu. ft. of air per minute, not 133,000 cu. ft. as was erroneously stated.

TURBO-ALTERNATOR DESIGN

An American Progress Report

MAIN lines of progress in the construction of large steam turbines for generator drive were discussed in a paper presented by Mr. G. B. Warren to the American Society of Mechanical Engineers recently. Developments have consisted largely in :—(1) The building of larger units to meet the growing demand for power, thus reducing capital expenditure per kWh ; (2) continual refinements in design, manufacturing processes and materials in order to increase reliability ; (3) the use of higher initial steam pressures and temperatures, coupled with improved heat cycles (*e.g.*, regenerative feed heating, resuperheating and air preheating) to decrease fuel consumption per kWh ; (4) the utilisation of an increasing proportion of available energy in the steam cycle. The main endeavour has been to decrease overall plant investment through improvement in reliability and operating costs through higher efficiency, which are of much greater significance to the plant owner than first cost. The result has been that by 1939 the average coal consumption per kWh sent out in the United States had fallen to 1.39 lb.

Hydrogen Cooling

Hydrogen cooling has permitted the construction of large turbines running at 3,600 RPM instead of 1,800 RPM. Higher speeds result in greater reliability and efficiency at lower capital cost. Where the leaving loss from the last stages of condensing turbines is not a determining factor the turbine efficiency ratio (the relation between energy obtainable as output and that theoretically available) is usually increased with speed. In that part of the turbine with high-volume flow, *i.e.*, on most low-initial-pressure turbines and on the condensing end of all turbines, this increase is small and may even be negative. When the volume flow is low, as at the h.p. end of even large-capacity turbines and with almost all small turbines, the gain with increasing speed is greater.

It is easier to build reliable machines for high pressures and temperatures with the smaller dimensions of shells and rotors and interstage diaphragms of high-speed units. For example, it is doubtful whether a 1,200 RPM turbine of reasonable efficiency could be built for 1,200 lb. per sq. in. and 950 deg. F., whereas at 3,600 RPM the design presents no difficulty. Deflections and distortions with the shell-wall thickness and increased shaft span necessary with lower-speed machines at high pressures and temperatures would not permit the maintenance of the small clearances upon which high efficiency with high pressure depends.

In general, a two-row velocity first-stage wheel is regarded as best for a volume flow under 50 cu. ft. per sec. with a 3,600-RPM machine. Although not in itself so efficient as corresponding single-row impulse wheels, it gives a quick drop in the initial pressure and temperature through the first-stage nozzles and reduces the pressure on the h.p. and diaphragm packings, losses through which are major items with low-volume flows, and also reduces the rotation loss in the early stages. This arrangement also produces a relatively constant efficiency over a wide range of load. For volume flows between 50 and 125 cu. ft. per sec. the first stage should again be a two-row wheel, but after 75 to 80 per cent. full flow, the first-stage wheel should be by-passed to admit boiler steam conditions to the first-stage shell. This is known as a single by-pass machine.

By-pass Flow Regulation

Where the volume flow exceeds 125 cu. ft. per sec. the two-flow first-stage wheel, usually of full peripheral admission, may be retained, but it is so designed that full admission gives 60 to 65 per cent. of full-load flow. About 80 per cent. of full-load is obtained by admitting steam at full pressure and temperature to the first-stage shell, and full flow is obtained by by-passing steam at nearly boiler conditions to a still lower stage. This arrangement is called a two by-pass machine and it is seldom desirable to carry the process further. By-pass flow regulation is not applicable, the author considers, to high pressures and temperatures because of the larger portion of the turbine exposed to such steam conditions, and the older system incorporating an internal by-pass valve is then preferable.

The factor limiting the capacity of condensing turbines is generally the projected area through the last-stage bucket annulus. While the earlier stages of a turbine carrying a given last-stage bucket can be built to pass any quantity of flow and to give any capacity, the velocity of steam leaving the last-stage buckets would increase approximately as the capacity and the energy in the steam thus thrown away would go up approximately as the square of the capacity. A point is soon reached at which this exhaust-loss energy is so great as to make it uneconomical to increase capacity in this way. Leaving loss generally ranges from 2 to 6 per cent. at maximum load, depending on steam conditions, vacuum, extraction, etc.

Turbine Size Limits

The mechanical limit at present to the annulus area (pitch circumference by the length of bucket) at any given speed is approximately 25 sq. ft. at 3,600 RPM and four times as much at 1,800 RPM. For a given last-stage bucket area, turbine capacity generally increases with initial pressure and temperature, if resuperheating is used and if steam is extracted for regenerative feed-water heating. A maximum of from 600 to 1,200 kW can be obtained from each sq. ft. of last-stage bucket annulus, and 80,000- to 100,000-kW 1,800-RPM. turbines can be built for single flow, but 3,600-RPM units above 25,000 kW usually have to be double-flow.

A quadruple-flow exhaust arrangement is being used on a 100,000-kW cross-compound turbine. The tip speed of these last-stage buckets is so great that erosion is caused by impingement of the tips upon the slow-moving moisture particles in the steam. Heavier moisture particles can be separated in chambers surrounding the tips of the later stages, causing a reduction in efficiency of from 0.25 to 0.75 per cent., being less on the larger and lower-speed machines. Stellite shields on the outer portion of the higher-speed last-stage buckets have proved effective in preventing undue erosion.

American Power Schemes

100,000-kW Sets

AS part of its expansion programme the Public Service Electric & Gas Co., the principal subsidiary of the Public Service Corporation of New Jersey, has placed an order for another 100,000-kW generating set for its Burlington station, states *Reuter's Trade Service*. The new set, with ancillary plant and transmission lines, will cost $11,500,000 and will be ready for operation in 1943. The order is in addition to the $12,000,000 initial step in the building programme started at the Burlington station last autumn, which includes the installation of a similar 100,000-kW generator, and will increase the capacity of the station from its present 55,000 kW to 255,000 kW. Ultimately the station's capacity will be increased to 350,000 kW. Since 1936, the Public Service Corporation has allocated more than $60,000,000 for the expansion of its electric service in the State of New Jersey. The turbo-generator just ordered and the one now being installed are of the cross-compound condensing type. Each will consist of two 50,000-kW units, one high-pressure and one low-pressure, and will operate at about 1,250 lb. per sq. in. and 950 deg. F. The speed of the Burlington machines will be 3,600 RPM.

Following the announcement of the award of contracts for three generating units for Cherokee Dam, Mr. G. R. Clapp, general manager, reported that all heavy equipment required for the power expansion programme of the Tennessee Valley Authority had been ordered from manufacturers. Less than a month has elapsed since Congress authorised the $65,800,000 emergency programme, which includes the building of Cherokee Dam, the construction of generating units at Pickwick Landing and Wilson Dam power-houses and the new Watts Bar steam plant. The contract for the three 40,000-HP turbines for Cherokee went to the S. Morgan Smith Co., York, Pa., for $676,050 and the three 30,000-kW generators will be manufactured by the General Electric Co. of America, at a cost of $1,206,565.

SECTIONALISE WHOLESALERS!

The Case for the Small Firm

By "Sala"

FROM a manufacturer's standpoint the interesting controversy carried on in the columns of the ELECTRICAL REVIEW concerning wholesalers and others requires further elucidation before it is understood sufficiently to allow of suggestions or action being taken to curb any anomalies which actually exist.

Whilst every effort is made by manufacturers distributing their goods through wholesalers to compel those wholesalers to resell at fixed prices it is acknowledged to be almost impossible to ensure that fixed selling prices are maintained. In general, manufacturers are not vitally concerned with the ultimate selling price. They have chosen the wholesaler as the best and most economical distributor of their goods and the manufacturer's profits are based on his selling prices to wholesalers, not retailers or users. He obviously favours his goods being sold at a price which the ultimate user can afford to pay—a price which is considered just and reasonable. It follows, therefore, that any action which he takes to endeavour to force the wholesaler to resell at fixed prices is action which is taken on the wholesaler's behalf. In other words, he is doing the wholesaler a service which should be quite unnecessary; forcing him to make a reasonable profit on his transactions.

No excuse can be made for the so-called wholesalers who seek trade discounts to which they are not entitled, but it is felt that the elimination of all small wholesalers is extremely undesirable and would not be in the interests of the industry. These small wholesalers often came into being by taking advantage of the scope for the sale of certain electrical accessories in territories where their larger rivals had been established for years. They did not necessarily cut prices to secure business; they simply took on the job of introducing, selling and distributing products which their larger brethren did not wish to be bothered with, usually small inexpensive articles of equipment on which the margin of profit was not high.

The Manufacturer Decides

It may even be said that there have been extreme instances of manufacturers creating these small distributors, because there was no other outlet of distribution for their goods due to the fact that established wholesalers in certain towns were not particularly interested in handling them. This article is not a condemnation of large wholesalers, but it endeavours to justify the position of some of the smaller fry who have genuinely helped manufacturers in the efficient introduction, sale and distribution of their goods. After all, the manufacturer has the right to decide how his goods shall be distributed.

Take as a typical example the case of a well-established wholesaler in a large town who is particularly well known as specialising in the sale of domestic electrical appliances. He relies mainly on his well-equipped showroom and his varied choice of appliances attractively displayed to interest his visiting clients and effect a sale. He employs two salesmen who mainly concentrate on the retailers and contractors in the town. In the same town is a small wholesaler, frowned upon by his larger competitor, who ridicules his claim to wholesale status and casts scorn on his paltry premises and his lack of showroom space. The smaller wholesaler employs three representatives who consistently canvass all industrial users of electrical equipment in the town and surrounding suburbs. He keeps large stocks of all equipment in regular demand from those industrial users and can be said to specialise in such equipment.

It cannot be denied that a manufacturer of industrial electrical equipment will choose the smaller wholesaler as his distributor in preference to the larger wholesaler. The smaller man may not be considered a wholesaler by his larger competitor but he does a better job of selling industrial equipment and has developed a reputation and an excellent connection amongst users. That is what attracts the manufacturer in this case. The commodious and attractive showroom makes no appeal to him.

It is obvious that wholesalers cannot be just "persuaded" that the smaller wholesalers are carrying on genuine wholesale business. Admittedly, they must have entered the wholesaling business at some time as interlopers by originally persuading some manufacturer that they could create a market for his goods, but the type of competitive business carried on during the last few years would not have allowed of the creation of new outlets of distribution by persons unable to prove to manufacturers their ability to secure for them a large volume of business through the connections which they had established.

The essence of a genuine wholesale business if often defined as the holding of adequate stocks of a variety of goods, but the definition may be a misnomer if specialisation in the sale of certain products is not taken into consideration. A wholesaler concentrating on the sale of certain of the smaller items of electrical equipment may hold adequate stocks of a variety of goods yet his capital outlay is not comparable to that of the wholesaler who is specialising in the sale of high-priced commodities such as washers, ranges and refrigerators. It would not satisfy the manufacturer of small electrical equipment to suggest to him that it would be to his advantage to confine his sales to those wholesalers who specialised mainly in the sale of expensive products to markets which had no interest and were never likely to be large users of his products. It would certainly be very unfair to try to force the manufacturer to distribute his goods through wholesalers who were not particularly interested in them. The manufacturer may have tried that before and found his mistake.

Efficient Distribution

The superfluous middle-man whose function is nothing more or less than an order taker, who carries no stocks and leaves the manufacturer to deliver the goods to his customer is fast disappearing—weeded out by every reputable manufacturer—but this does not cure all the ills of wholesaling. Electrical wholesaling in this country will never be entirely satisfactory to all the manufacturers of electrical products who rely on this method of distributing their goods until the subject of efficient distribution is thoroughly understood by both manufacturers and wholesalers.

Sufficient vital centres throughout the country in which stocks of his goods are held to adequately serve all users is the aim of the manufacturer, but if the scheme of distribution has one or more weak links due to wholesalers in certain towns or districts being uninterested in the manufacturer's products the manufacturer cannot just leave it at that and grin and bear it. He knows there is excellent scope for the sale of his commodities in those areas and so he finds someone, eventually, who can achieve the results he wishes to attain.

Don't blame the manufacturer. His goods have to be sold and if he is satisfied that the person who can sell them has the necessary connections and will carry out the true functions expected of him—hold adequate stocks, purchase in minimum quantities sufficient to justify wholesaler terms being granted to him, and employ a sufficient number of salesmen to adequately cover all users and prospects in the area, then he is given every encouragement by the manufacturer. Every well-organised manufacturer has a fairly good knowledge of the scope for his material in most towns and industrial areas, and he is not going to upset his whole scheme of distribution by appointing unnecessary distributors in these areas if he is satisfied that the existing ones are achieving reasonably good results.

Results of Inexperience

Now let us take another typical example. The person appointed by a manufacturer of small electrical accessories as distributor may or may not be a small wholesaler, but let us say that he specialises solely in the sale of related electrical equipment and carries out his distributing functions to the entire satisfaction of the manufacturers whose products he handles. A competitor in the same town specialises principally in the sale of domestic appliances of certain well-known brands and has been visited regularly by the representative of a manufacturer offering him competitive alternatives to those branded goods. The wholesaler is not tempted. There is no advantage in price and existing brands are well established.

In due course that same representative presents himself to the wholesaler who specialises only in small industrial electrical equipment. He has been prompted by his employers to secure

a distributing outlet in that town. The proposition is discussed and further discussed until the wholesaler is convinced that prospects are bright enough for him to have a shot at taking up this line even though it is out of the category of goods which he is accustomed to handling. Then the trouble starts. The wholesaler has no specialised experience either of selling or of service of a new line. Eventually he finds that he cannot get a foothold in the market. The manufacturer's representative does his utmost to assist him but finally has to give it up as a bad job. The stocks which the wholesaler has acquired remain on the shelves until he makes a desperate attempt to dispose of them at cut prices. His attempt is quite successful so he is tempted to order up another supply and dispose of them in the same way.

Now who is to blame for this state of affairs ? It is the manufacturers whose sales policies are so lax that they allow any Tom, Dick or Harry to purchase their products for resale instead of confining their sales to the distributors who have proved selling experience and excellent connections with the customers who are most interested in the products. In the case just instanced, it was the manufacturer's job to create a demand for his products in that town and so force the wholesaler who had an established connection in domestic appliances to stock his products also.

It behoves all genuine wholesalers and manufacturers to get together and thrash out for all time this important question of distribution. It will never be satisfactory to all until electrical wholesaling is classified into separate and distinct sections. Domestic electrical equipment stands out as a section complete in itself—a section which does not mix well with wall switches, insulating materials and ceiling roses. It would be difficult to visualise a smart wholesaler's salesman who has just finished demonstrating an electric washer priced in the region of £40 immediately changing the subject and asking his client if he wants any ceiling roses or insulating tape.

Manufacturers would welcome an opportunity of discussing these problems with wholesalers in general, but it can be stated in advance that wholesalers would not have things all their own way. Manufacturers sell their goods and they must have stocks available through local wholesalers to serve the immediate requirements of users. Prices of their products must be maintained at a minimum if the demands from users of those products are to continue.

These valuable and important factors are the sole reasons why the manufacturer has chosen the wholesaler method of distribution—reasons which make it imperative that the wholesaler's function is carried out to the full if the user is to obtain the service, the attention and the reasonable price to tempt him to buy. The simple functions without the ability or interest to *sell* the products are useless to the manufacturer.

NEW BOOKS

Tool Design. Radio Measurement. Diesel Operation

Production Engineering (Jig and Tool Design). By E. J. H. JONES. Pp. 300 ; figs. 240. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 12s. 6d.

This is a practical work, recommended by the Institution of Production Engineers, whose president has contributed the foreword, in which he describes the two chapters on broaches and fixtures as " unique " in that they make public for the first time in English much information that has hitherto been exclusive to a few people.

The author has drawn upon his extensive experience of most shop requirements, gained during his many years management of the works of the Associated Equipment Co., Ltd., which makes London Passenger Transport vehicles. He writes in understandable language, passing on what will be appreciated by the experienced tool maker and should be sought after by the student. Not only has he described how to design a large variety of tools (excluding press tools) but has related designs to economical forms for producing differing quantities of articles ; the examples chosen have all been tried out and used successfully. Purely mass production examples are avoided.

The reader is expected to have some knowledge of the principles involved and most branches of the subject are touched upon, indicating how tool design has increased the adaptability and enlarged the productive capacity of standard machine tools.—W. O. F.

Radio Frequency Measurements by Bridge and Resonance Methods. By L. HARTSHORN. Pp. 265 ; figs. 99. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 21s.

This book is one of a series of monographs published with the intention of providing a modern orientation of a particular subject, and in this volume the object has been to give a systematic account of the basic principles and general working ideas that, in this subject, form the tools of the practising technician. The subject is developed from first principles, and will appeal primarily to those who are engaged in practical work connected with the measurement of what may be called the ingredients of radio frequency, i.e., capacitance, inductance, resistance, and so on.

The work starts with an outline of the principles of impedance, resonance and screening ; then passes on to apparatus, including generators, detectors, standards of capacitance, resistors, standard inductors ; and finishes off with methods of measuring capacitance, inductance, resistance and waves.

It is extremely difficult for an experimenter in this field to obtain information and instruction without spending much time in the pursuit of scattered literature, and it is here that this authoritative book will prove of great value. It is not an encyclopedic account of this literature, but describes rather the methods which the author himself has found to be most suitable. These methods, the author says, have been gradually evolved as the result of the work of many investigators, and though original papers are sometimes quoted they should be regarded merely as examples for further information on special points. The book should prove of great value to those radio engineers or other research workers who are engaged in the measurement and testing of high-frequency circuits.—C.G.C.

Diesel Engines and Diesel Electric Power. By E. L. RICHARDS. Pp. 312 ; figs. 172. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, London, W.C.2. Price 10s. 6d.

It can safely be said that the majority of textbooks dealing with the Diesel engine have been concerned more particularly with the theories underlying the various cycles of operation which are available for the use of designers and with the distinctive features of the different designs which have been placed on the market. As a consequence, the operating engineer has long had the legitimate grievance that the many problems met with during the running and overhauling of his Diesels have not received the attention which they deserve. True, the makers usually issue " Instructions " for dealing with such problems when the engines are newly installed, but these often get mislaid or destroyed and the engineer-in-charge is often in a quandary as to the correct method of procedure for overcoming the many peculiar difficulties which arise from time to time.

Here is a book which seeks to meet this grievance, and it is all the more welcome to electrical engineers because it deals more particularly with the problems of the engineer in the Diesel-electric power station. It may, however, claim a wider public since frequent reference is made to the use of Diesel-electric power for the driving of tractors and railcars as well as for the propulsion of ships.

Some idea of the scope of the book may be gathered from a brief summary of the contents. There are eight chapters in all, the first of which covers fundamental principles such as cycles of operation, compression ratios and so on. Then follow chapters on fuel injection, fuel combustion, starting, exhaust and lubrication, all of them dealt with from a thoroughly practical angle and accompanied by numerous drawings and illustrations of the details of well-known makes of engine. The seventh chapter is devoted to operating procedure and comprises starting, stopping, inspection, cleaning, and the carrying out of repairs and overhauls. Finally, there is a comprehensive chapter on the electrical side of the plant, both DC and AC.

The book is of American origin and the references are, therefore, to American practice, but it seldom occurs that these are greatly different from British practice, while the fundamental problems underlying the designs are, of course, the same. Thus, it will be appreciated that there is much information of a thoroughly practical nature which should be of great value to all electrical engineers who have to deal with any form of Diesel-electric plant.—A. R.

Shorter Notices

Electrical Contacts. By G. Windred, Pp. 403 ; figs. 130. Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2. Price 16s.

Design of Electrical Apparatus. By John H. Kuhlmann. Second edition. Pp. 506 ; figs. 261. Chapman & Hall, Ltd., 11 Henrietta Street, London, W.C.2. Price 30s.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication.
The Editors cannot accept responsibility for correspondents' opinions

Lighting Terminology

AN article such as that by Mr. Howard Long on "Lighting Terminology" in your issue of November 1st makes very interesting reading and reminds one of the ease with which fundamental details can be forgotten in the routine of practical application.

Mr. Long is however at fault in referring the definition of "Efficiency—of a light source" contained in B.S.S. 233 to the case of a light source plus a reflector. The separation of these two is made clear by the same specification in the definition of angle of cut-off which, relating to a lighting fitting or reflector, is the greatest angle below the horizontal at which no part of the light source is visible from a point outside the fitting. The efficiency of any article consuming or transposing energy is the ratio of the energy input to the useful energy output and for a lighting fitting is the ratio of the amount of light impinging on the fitting and the amount reflected or transmitted by the fitting, excluding in both instances any light proceeding direct from the source to the object lighted. This ratio is of little practical use and custom refers to the light output ratio as the efficiency, this being the ratio which has practical application.

I have always considered diffusion ratio as rather impractical. Perhaps Mr. Long can enlighten your readers and myself as to the best approach to this problem in the following circumstances which occur at a Yorkshire engineering works. In the tool room of this works the foreman as well as the staff work on the machines as may be necessary. The foreman is 4 ft. 11 in. in height and usually wears a white smock. One of his toolmakers is 6 ft. 1 in. in height and usually wears dark blue overalls. In view of their difference in height they do not stand in the same positions at the machines, as is the case when workers' eyesight varies. How would the correct diffusion ratio for these circumstances be found ?

I do not agree that a uniformity ratio of 70 per cent. or higher can be obtained with dispersive reflectors using the spacing-height ratios recommended by all the leading reflector manufacturers. It is noteworthy that with some fittings reducing the spacing-height ratio leads to a reversal of the normal uniformity and to a light spot between fittings instead of below them.

In his table of terms Mr. Long uses the symbol "S" to denote area. This symbol is normally used to denote the surface area of a solid and the symbol "A" is generally used to denote the area of a plane surface.

Birmingham, *November 12th.* H. G. BATSON.

Wholesalers and Others.

I was very interested in the article in your issue of October 25th by a Manufacturers' Representative on "Relations with Wholesalers," but I would venture to state that in the main the problems, as stated, which confront the legitimate wholesaler are those which they have been grappling with for years. Thanks, however, to a measure of co-operation by leading manufacturers with the Fair Trading Committee and the E.W.F. conditions are to-day considerably better than they were a few years ago but, of course, even now leave much to be desired.

With regard to the statement that there are too many wholesalers, one might say with equal justification that there are too many manufacturers. In many cases goods are made to identical specification and prices and discounts are exactly similar, good examples of this being lamps and cables. The multiplicity and variety of finishes on such items as switches, plugs, accessories and domestic appliances are almost unbelievable and I feel that a reduction in a number of finishes and types would be generally welcomed.

Following on the above it will be seen that it is not fair for any one manufacturer to complain that the wholesaler does not carry a full range of all manufacturers' products, since he is probably maintaining as much stock as is compatible with business prudence and sufficient for local needs and preference.

I note the basis laid down for a successful wholesaler's business, but if a considerable amount of turnover is done with industrial users it is necessary to add to the list already given a good

(*Concluded in next column*)

Institution Proceedings

The Colliery Electrician's Work

AT the second meeting this session of the South Wales Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS at Cardiff on November 9th various aspects of "a day in the life of a colliery electrician" were discussed informally by the members.

Inaccessibility of bolts in switchgear of certain types was referred to and manufacturers were asked to consider this question seriously. One of the difficulties arose when examining oil level in switches; there was no external indication, which necessitated dropping the tank. This involved unbolting from behind the tank, which was not easy. One speaker said he had examined an air-break starter of well-known make. He found the makers had used six ½-in. bolts made of very poor quality iron. He also found a defective casting. He urged engineers and electricians to demand of the manufacturers a certificate for reference.

A suggestion was made that equipment underground should be painted white. An objection to this was the dusty conditions prevailing. This was countered by a further suggestion that each employee concerned with the operation and maintenance of the gear could wipe the apparatus over on each visit of inspection.

It was urged that special attention should be paid to the oil level in tanks and a case was mentioned of a tank in service that was found to be quite dry. It was no use having a competent engineer on the surface and an electrician of very doubtful ability underground. In connection with maintenance, it was agreed that equipment, particularly at the coalface, called for regular and thorough examination and that no examination was complete without a test. Many collieries had a system which caused trailing cables to be brought to the surface each month for examination while other collieries seemed inclined to use the trailing cables as tub rails.

So much remained to be covered, that it was decided to continue the meeting at Pontypridd early in January next.

Electrical Vocabulary

THE origin of the "enormous vocabulary" which had grown up in electrical engineering in the last 100 years was discussed by Prof. G. W. O. Howe, Dean of the Faculty of Engineering and hon. president of the GLASGOW UNIVERSITY ENGINEERING SOCIETY, in his presidential address.

After referring to the large body of interconnected conceptions to which names had been given, he said it was not surprising that there were at the present time considerable differences of opinion, even among experts, about the meanings to be assigned to certain well-established terms. One of the great difficulties in electrical engineering was that one dealt almost entirely with abstract conceptions. Many of the terms commonly employed in electrical engineering were introduced by Faraday. There were also terms which were used in an entirely different sense from that which originally attached to them.

Mr. Dinwoodie, the chairman, recalled that this year marked the centenary of the founding of the first Chair of Engineering at the University and it was also the fiftieth anniversary of the founding of the University Engineering Society.

I.E.E. (East Midlands Sub-Centre)

THE East Midlands Sub-Centre of the I.E.E. is holding a luncheon in Nottingham on December 11th which will be followed by a paper and a discussion. It is hoped that the president of the Institution will attend.

Wholesalers and Others—(*Concluded from left-hand column*)

knowledge of industrial electrification methods and installations; a fairly complete knowledge of the I.E.E. and Home Office Regulations, together with a general technical knowledge of electricity and its various applications. In addition to this, the wholesaler has to be a veritable mine of information as to where the most unusual types of goods and material can be obtained.

Coventry, *November 7th.*

ELECTRO-MECHANICAL SUPPLIES, LTD.
J. M. Hollander, *Director.*

APPLIANCE MAINTENANCE

Simple Tests and Repairs

By J. E. Noble

ONE effect of the war has been an acute shortage of skilled labour, and this is particularly felt by the smaller electrical traders and contractors, who are having to make the best of it with a reduced and sometimes semi-skilled staff. Housewives of to-day have come to rely extensively on their labour-saving electrical appliances, and as the domestic industry must be kept going someone must be available to do the necessary "servicing."

The first essential, and this cannot be too deeply stressed, is to have some simple and reliable means of circuit testing always ready for instant use. Not only does it save time on actual tests, but tests are apt to be scamped or omitted altogether if gear has to be made up as and when required.

I have found the simplest and most effective test layout for small domestic jobs to be as follows :—Assemble two b.c. batten lampholders and two 5-A two-pin plug bases on a 6 sq. in. board ; wire one plug base and one lampholder in parallel across the mains ; wire the other plug base and lampholder (complete with lamp) in series and across the mains with the lampholder on the live side.

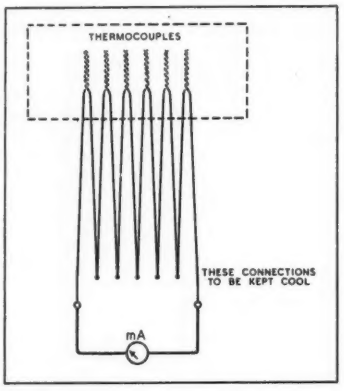


Fig. 1.—Simple form of thermocouple

Two sets of flexible test leads should be provided, each with a 5-A plug top at one end. One pair should have test prods at the free end, and the other pair the split sockets from a cheap universal iron connector. It is an advantage to have the two pairs of leads saddled at a point about 6-in. from the plug tops, as they are then always handy, and do not have to be searched for when required. If desired, an extra flexible earth lead complete with crocodile clip could be provided.

The pair of leads with the iron connector sockets can be clipped on to any make or size of plug top—and, when plugged in series with the lamp, will give an immediate indication of circuit. Likewise the other pair of leads can be used for point-to-point circuit testing.

Electric Irons

A year or two ago the domestic electric iron did not present much of a problem, but nowadays the thermostatically controlled type is a little more involved. With this design the actual fault location should present no difficulty ; everything is in series, except where a pilot bulb is fitted and shunted across a couple of inches of resistance wire which is in series with the element. If the iron does not get hot, simple point-to-point testing will locate the trouble. It is when the thermostat has to be reset that the trouble starts. The small trader usually has no means of measuring heat and, while the adjustments are by no means critical, they must at least be "somewhere near." Incidentally, judging by my own experience, the variation between different makes is quite noticeable. I have overcome the difficulty of heat measurement by using thermocouples and a milliammeter and the gear is quite easy to construct. Any moving-coil milliammeter with a full-scale deflection of 1-10 mA will do ; I have used one reading 0—6 mA. Briefly, the action of a thermocouple is based on the heating of the junction between two dissimilar metals of certain kinds which causes a difference of potential to be set up ; if a suitable meter is connected across the junction, a deflection will be observed, the magnitude of which will vary with the heat applied. For the test gear described I have made junctions of iron wire and "Ferry" wire (as used for motor starters), both 22 SWG, which were to hand. The type of wire used for heater elements, e.g., "Brightway," will not work in conjunction with iron, but it will work with "Ferry."

A junction is made by taking two wires, one of each kind, approximately 6-in. long, and twisting them tightly together at one end. They can be left at that, although it is desirable to weld them together in a bunsen flame. Unless the meter is extremely sensitive, several couples in series will be required to give a good range of readings. I have used ten, laying the actual junctions in sawcuts in the surface of a piece of asbestos slate, approximately 4 by 2 in. (fig. 1.)

The junctions were covered with a thin sheet of mica, and the ends of the first and last couple brought out to two terminals. As the series connections will also be thermocouples, acting in opposition to the main couples, they should be kept cool. That is why the wires should be at least 6-in. long, so that the series connections can be kept away from the heat of the iron under test. It is not necessary to calibrate the apparatus to any standard temperature scale. Several irons taken from stock were tested and curves drawn up of meter readings for different thermostat control settings, making a separate curve for each make of iron. Actually, several irons of each make were tested, and the mean figures taken ; these showed quite an appreciable tolerance. When fitting new elements care must be taken to see that they are a good fit, and, if possible, a genuine maker's spare should be used. Indeed, with the controlled type, it will be found impossible to use any other.

The sole plate should be carefully examined as any small blobs of metal caused by the disruption of the old element will quickly cause a similar destruction of the new one. Any such blobs should be chipped off, or ground level ; it will usually be impossible to file them.

Kettles and Toasters

For kettles and toasters simple point-to-point testing will apply for fault location. When new flat-type kettle elements are fitted they must bed down properly, as imperfect bedding will not allow full transfer of heat from the element to the kettle bottom and so will quickly cause a burn-out. With the "safety" type, the makers usually recommend that the kettle shall be returned to them for repair, and this is an excellent plan, unless a skilled staff is available to reset the safety device accurately. This does not apply, of course, to the type which has the "fuse" safety device, as this is easily set. The contacts should be cleaned up if pitted.

Where a kettle has been boiled dry and the solder has run out of the bottom, the elements and all the electrical parts should be removed and the kettle handed over to a skilled tinsmith for repair ; this is definitely not a job that can be tackled by semi-skilled staff. After the repair the elements, if suitable for further service, can be refitted, but they must be in exactly the original position in order to avoid trouble in bedding down.

Elements of the immersion type seem to be the modern tendency in kettles, as they give greater efficiency of heat transference. They rarely develop faults in normal use, but when they do go wrong, a new element is usually indicated. This applies also to the usual run of small immersion heaters such as those for heating shaving water and, taking it on the whole, to curling tongs, trouser-creasers and fish-tank heaters.

No difficulty should be experienced in fitting new elements to small toasters, not is any special care required, beyond seeing that all parts of the element are clear of the frame. With the larger automatic type a fair amount of mechanical skill may be required in complete dismantling and reassembling. The repairer is advised to examine the apparatus as carefully as possible before dismantling ; a spot of oil judiciously applied to a sluggish mechanism will often save an hour or two of intricate labour.

Vacuum Cleaners

Vacuum cleaners are probably more numerous (owing to intensive sales promotion) than any other household appliance, except the electric iron, and, being more complex, are perhaps

the most difficult to service. As regards the purely mechanical side, e.g., wheels and agitator brushes, it is usually obvious where the fault lies, and the service man must decide on his own initiative whether to replace or repair the faulty parts. The electrical parts external to the motor should also present no problem; simple point-to-point testing will locate a fault in the flex or handle switch, or tie the fault down to the motor itself.

The motor, although a simple "series" machine, demands considerable skill in effecting a complete repair. Nevertheless, some of the simpler faults can be tackled by semi-skilled staff, provided a little deductive reasoning is applied. Tests should be made by means of leads with a 100-W lamp in series. A vacuum cleaner motor which is in good order will run slowly in series with a 100-W lamp and the glow of its filament gives a useful indication of what is happening.

If tests at the motor terminals indicate open circuit the armature should be turned slowly by hand while the test leads are applied, as armature open circuits, if not too numerous, will at once be indicated by intermittent lighting of the lamp and sparking between commutator segments. Intermittent lighting of the lamp may also indicate worn or stuck carbon brushes. It may be found that the brushes have completely worn away and that the machine has been running on the springs until they, too, have worn away. In that case, not only will new springs and brushes be required, but the commutator will have to be turned in a lathe to get rid of the grooves and roughness due to excessive sparking.

On the other hand, the brushes may only be stuck in the holders, due to the accumulation of carbon dust and oil. The brush holders should be thoroughly cleaned and special care should be taken to see that the brushes do actually touch the commutator and are quite free in the holders. One other notable source of trouble in some makes of cleaner is the breakage of the short flex lead from the motor which, terminating in a plug top, fits into the base of the handle.

The most fruitful source of "earths," probably 90 per cent., on these small motors, is an accumulation of carbon dust on the brush holders. The cure is the thorough cleaning and scraping of the insulating bushes or the fitting of new bushes if the old ones are badly charred. The remaining 10 per cent. of "earths" will be on the windings and commutator, and, in general, mean a rewind of the affected part, or perhaps a new commutator.

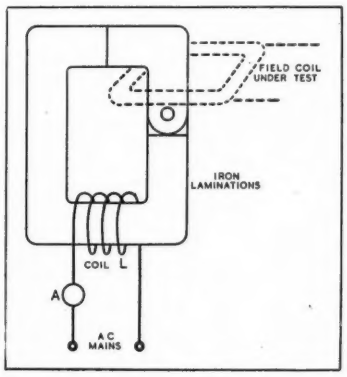


Fig. 2.—Testing faulty field coils

An open-circuited field coil is fairly easy to locate, and may be due to an imperfectly soldered joint at the spot where the flex lead is joined to the winding proper, or to the coil chafing on the corner of the laminations. In the latter case an "earth" may also be apparent, and the only remedy is to rewind.

A partially short-circuited coil may be more difficult to locate. The effect will be a lowering of speed of the motor and overheating. As this can also be caused by tight bearings or an accumulation of fluff and dirt behind the fan, these points should be carefully checked. A resistance test will not always reveal the faulty coil, as only a few turns may be shorted, and anyway the two coils (these motors are invariably two-pole) may not have exactly the same number of turns. I favour the absorption method, although this entails taking the field coils off the laminations for test, but they have to come off in any case if the diagnosis is correct.

The simplest way of applying this test is to use the apparatus shown in fig. 2. The dimensions are not critical, and the iron circuit is built up of laminations to a section of approximately $\frac{3}{4}$ by $\frac{3}{4}$-in. For 230-V, 50 cycles the coil L would have approximately 1800 turns of 28 SWG copper wire, and one corner of the laminations should be hinged to facilitate the insertion of the coil to be tested. If there are no shorted turns on the coil under test, it will not be affected in any way, nor will the current through the exciter coil L be altered. If, however, shorted turns do exist, these turns will have a current induced in them and will show an appreciable temperature rise, with an increase in the current through coil L.

Open circuits on the armature are normally detected by the drop-test (fig. 3). An open circuit between two commutator segments at X, will give full deflection on the meter, with no reading at all between adjacent segments. A short circuit at X will give little or no reading. Short circuits are not so easily detected by this method, as in the majority of cases the length of wire on each coil varies (although the number of turns does not) and misleading results can be obtained. I favour the absorption method again, but in this case no special apparatus is needed. The completely assembled motor is merely connected in series with the 100-W test lamp, and the armature rotated slowly by hand. A short circuit will immediately be indicated by a regular rise and fall of brilliance of the test lamp. Short circuits in the armature are often due to faults on the commutator and can be cleared without much trouble. If a commutator has been deeply undercut an accumulation of carbon dust and oil in the slots can give the foregoing symptoms.

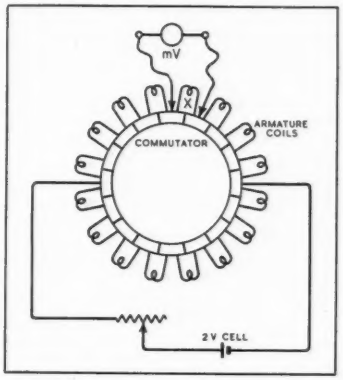


Fig. 3.—Locating open circuit in armature

These particulars regarding vacuum cleaner motors will also apply in the main to other small motor-driven appliances, such as sewing machines, hair dryers and whisks and, in fact, to any small series motor. One further point worthy of note is that when undercutting commutators the *full width* of the mica should be cut down, using an old hack-saw blade ground to the right width. A selection of blades of various widths should be kept handy.

Testing Steel Rails

STEEL running rails of railways in the United States and Canada are being examined *in situ* for internal defects with the aid of mobile cars, developed by Sperry Products, Inc., Hoboken, New Jersey, U.S.A. The coaches are attached to ordinary trains for haulage from one area to another, but are self-propelled when actually testing. In the front-end compartment are the driving engine and auxiliaries, followed by a galley and living accommodation, with generator and recording compartments at the rear end.

Operation is based on the fact that any internal discontinuity in a metal bar creates an area of high resistance to the flow of DC; consequently a difference of potential will occur at the site of the internal flaw. The indicating currents are conveyed to the track rails by brush holders attached behind the front bogie and underneath the frame of the rear bogie of the coach, thus creating a magnetic field that is uniform in a sound railhead. But an internal fissure in the steel rail will disturb the current flow, so changing the flux density, which will set up electromotive forces in two staggered pairs of searching coils, mounted between the rear brushes, as they follow one another through the area of decreased flux density as the car moves along the rails.

With the aid of amplifying devices the resultant detector current is caused to actuate recording pens as well as apparatus for squirting a spot of paint on to the running rail at the site of each fissure for identification. About 1,500 A at up to 8 V is injected for pre-energising the rails to ensure uniformity of molecular arrangement prior to the introduction of the detecting current just in front of the searching element. This precaution is necessary because running rails are generally magnetised by the normal effect of the earth's field, augmented by vibration due to the pounding of passing train wheels. For this reason the

(*Concluded on next page.*)

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

WIGAN Electricity Committee has accepted the resignation of **Mr. J. M. Beck**, deputy electrical engineer, on account of ill-health. In consequence a staff reorganisation has been approved. **Mr. H. Winstanley**, the present station superintendent, has been appointed to the position of deputy electrical engineer with which for the time being the duties of station superintendent will be merged.

Mr. M. C. Toner, of Holophane, Ltd., has now taken over, on the company's behalf, the North of England area, including Lancashire and Yorkshire.

Mr. W. L. White, water heating specialist and representative of Berry's Electric, Ltd., has, by mutual arrangement, been appointed technical assistant to a company now engaged upon work of national importance. His private address will remain " Dartside," Manor Road, Hanbury Park, Worcester.

Dr. Frank Conrad, assistant chief engineer of the Westinghouse Electric & Manufacturing Co., recently completed fifty years' service with the company and to mark the occasion was presented with a diamond-studded gold emblem. Dr. Conrad is known chiefly for his work in radio broadcasting and among the honours conferred upon him have been the Edison and Lamme Medals of the American Institute of Electrical Engineers.

Messrs. S. Evans and H. Jennings, electrical engineers Grade II in the Colonial Service (Nigeria), have been promoted to Grade I.

Dr. F. B. Jewett, vice-president of the American Telephone & Telegraph Co. in charge of research, tendered his resignation as president of Bell Telephone Laboratories, Inc. to take effect as from October 1st, and has become chairman of the board of directors. **Dr. O. E. Buckley**, executive vice-president of the Laboratories, succeeds Dr. Jewett as president. The *Electrical World* states that there is no change in Dr. Jewett's responsibilities for the general programme of research in the Bell System, but the change will increase the time he has available in an advisory capacity to the Government as president of the National Academy of Sciences and as a member of the National Defence Research Committee. Dr. Jewett has been the operating head of the research programme of the Bell System for twenty-four years and responsible both for the programme and its operation since 1930. Dr. Buckley entered the Bell System in 1914. He became director of research in 1933, and executive vice-president in 1936.

Mr. S. F. Palmer, director and works manager of Westinghouse Rosebery, Ltd., was elected president of the Electrical Manufacturers' Association of N.S.W. at the annual meeting of the Association held recently.

Mr. H. W. Gifford, engineer in the Gloucester telephone area, who has taken up his new appointment as telephone manager of the Cardiff area, has been presented by officials and staff at Gloucester with a gold wristlet watch, silver cigarette case, and cheque. Mrs. Gifford was given a pewter tray.

Obituary

Mr. J. Lappin.—The death has occurred at Motherwell of Mr. James Lappin, who for over forty years was a member of the staff of Glasgow Corporation Lighting Department. Prior to his retirement ten years ago Mr. Lappin was eastern divisional superintendent. Mr. T. M. Lappin, a son, is public lighting engineer at Dundee.

Mr. E. T. J. Brandon.—The death occurred recently in Toronto of Mr. Edgar T. J. Brandon, former chief engineer of the Hydro-Electric Power Commission of Ontario. He was born in Toronto sixty years ago and was educated at that city's University. He joined the Power Commission in 1900 and retired about three years ago.

Will.—**Flying Officer C. W. Furse, M.A.**, who was recently killed in action, left £9,033 with net personalty £9,000.

Testing Steel Rails

(Concluded from page 61)

searching current might not induce sufficient molecular rearrangement in the rail head (already disturbed at the sites of fissures) to permit fault detection without occasional false indications.

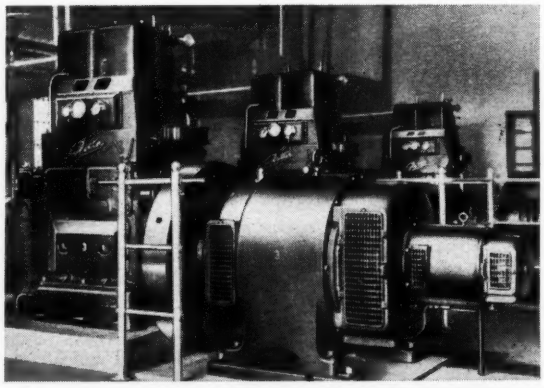
The magnetic poles strongly formed in this way are of two kinds; the effects of the superficial ones on the surface of the rail can be avoided by the use of suitable brushgear for conveying the test current to the rails, while those within the rail head can be overcome by raising the detecting current density to 275 A per sq. in., which means feeding 4,000 A to each rail at up to 4 V.

The testing currents are furnished by a petrol engine with gearbox and multiple-belt pulley which drives the main (8,000 A) and auxiliary (pre-energising) generators and a 200 V exciter mounted together in the car next to the recording compartment which contains two pen equipments needing up to 25 mA (one less sensitive than the other) with tape moving 0.625 in. per ft. of car travel, which is at the rate of 7 MPH when fault detecting.

According to *Engineering*, which without attempting to explain causes, discusses characteristic types of rail defects, in seven months 597,000 miles of track has been tested in this way this year, revealing 304,000 defective rails.

Electricity in Ceylon

THE three towns of Diyatalawa, Bandarawela and Haputale, situated about 120 miles from Colombo, form a triangle with sides five, six and seven miles long; they are at an elevation of 4,500 ft. above sea level. Notwithstanding the remoteness of the three towns, they are provided with electricity. Toward the conclusion of 1938 the Government Electricity Department, of which Major C. H. Brazel is the chief engineer, obtained the sanction of the Finance Department to proceed with the electrification of the whole area. Work was commenced in March, 1938, and completed in November of the same year. The central power station was erected at Diyatalawa, the supply for the other two towns being transmitted at 1,100 V. Altogether 10 miles of e.h.v. line and 14 miles of low-voltage line were erected, provision being made for extensions to double this length.



Petter "Superscavenge" Diesel engines driving Crompton Parkinson and Lancashire dynamos in a Ceylon power station

The motive power is provided by three Petter Superscavenge Diesel engines, each of two cylinders, which drive the alternators, comprising one direct-coupled Crompton Parkinson machine and two V-belt driven Lancashire dynamos, the latter having been taken from another power station. Each alternator has an output of 55 kW at 400 V, three-phase, 50 cycles, and the necessary interconnections have been made on the switchboard for parallel running of any two, or all three machines.

Unusual conditions attended the installation of the direct-coupled set. When it arrived the military authorities, through the Government Electricity Department, requested a 24-hour supply to be made available within seven days. At that time no foundation had been marked out, nor had the overhead lines been slung, although the poles were erected. The foundations were completed, the engine and alternator bolted down, final adjustments and auxiliary work carried out, and a supply made available in the time stipulated. True, the exhaust arrangements were temporary and so were the oil pipes and electrical wiring, but the fact that the set ran in this condition 16 hours a day for two months, until November, when the other sets were finished, is a tribute to the energy and resourcefulness of those responsible for the installation.

In November the official tests were run off. Fuel oil consumption was from 4 to 12 per cent. below the guaranteed figures, and lubricating oil nearly 25 per cent. lower. The rests were of ten hours' duration and consisted of six hours at full load, two hours at 110 per cent. load, one hour at 75 per cent. load and one at 50 per cent. load. A two-hour test at 25 per cent. load was taken some days later and gave good results.

With the exception of the e.h.v. line, which was erected by the Government Electricity Department, the whole of the contract was carried out by the Colombo Electric Tramways & Lighting Co., Ltd., the agents in Ceylon for Petter engines.

ELECTRO-PLATING

A Review of Present-day Methods

By R. R. Belbin

THE first essential of successful electro-plating is perhaps chemical cleanliness of the base-metal surface. To ensure adequate adhesion between the deposited metal and the base metal all traces of grease film, stains and oxides must be removed. Whereas degreasing and cleaning processes were once a single operation it is now definitely recognised that grease removal must be a complete process. This is carried out more rapidly by the organic solvent method than by emulsification. The solvent generally used and, probably the most powerful, is trichlorethylene. Further cleaning prior to plating is often carried out either in an alkaline or acid bath. The alkali bath contains solutions of tri-sodium phosphate and sodium meta-silicate operated at approximately 200 deg. F. Acid baths using hydrochloric 2, 5 or 8 per cent. by volume for an acid pickle give good results but are not extensively used. In either case adequate washing is essential afterwards in order to prevent carry-over and consequent contamination of the plating solution.

Electro-galvanising has been used for a considerable number of years. De-greasing is carried out in such solutions as tri-sodium phosphate. The plating bath more generally used is of the acid-sulphate type. A normal acid electrolyte contains, in addition to zinc sulphate, a conducting salt such as ammonium chloride and sodium acetate which acts as a buffer to regulate the acidity. The zinc bath is worked at room temperature and at a current density between 15 and 30 A per sq. ft. Where heavy zinc coatings are required, such as for steel wires, lead anodes are used and the acid concentration is high, being about 20 per cent. sulphuric with a working current density varying between 700 and 3,000 A per sq. ft.

Anodic Treatment

Anodising is an electrolytic process applied to aluminium. It provides an oxide on the aluminium by making the article the anode in an electrolytic bath. The nature of the film depends largely on the electrolyte used and the method adopted. The film will not strip off and is quite hard and will resist wear. It can be dyed in order to provide an attractive appearance. The plants used do not differ much from those used for electro-plating and the general procedure is about the same. Lead, iron or carbon are used as cathodes and the current density and voltage naturally depend on the electrolyte. Three different electrolytes are used, chromic acid in distilled water, sulphuric acid and oxalic acid. The last two are more generally adopted and both provide a rather transparent film upon the article. The film thus applied artificially does not exceed a thickness of 0.001 in., which is found to be quite satisfactory under all conditions of use.

Nickel-Chromium Plating of Tinplate

Tinplate has certain advantages over sheet steel and lends itself well to plating, providing the recommended procedure is carried out. Previously, peeling of the coatings was noticeable, but if the total thickness of the deposit is limited to less than 0.0005 in. good results are obtained.

The procedure recommended is as follows :—Remove grease by organic solvent. Clean the tinplate electrolytically as cathode in a sodium-carbonate solution. The preferred conditions are :—Solution, 8 oz. of Na_2CO_3 per gal. ; temperature, 140 deg. F. ; nickel anodes ; current density, 50 A per sq. ft. ; time, 5 min. as cathode followed by reversal of current for 1 or 2 min. Rinse ; deposit a thin film of copper from a cyanide solution. Rinse ; dip in a suitable acid solution (cream of tartar or acid nitrate solution) and once more rinse. Nickel-plate to an average thickness of 0.00025 in. Any nickel plating solution giving a reasonable ductile deposit will probably be suitable. Polish if necessary and chromium plate.

As a means of securing bright plating which requires no buffing the following solution is typical of baths used for the electro-deposition of nickel-cobalt alloys :—Nickel sulphate 32.0, nickel chloride 6.0, sodium formate 4.6, boric acid 4.0, cobalt sulphate 2.0, ammonium sulphate 0.3, formaldehyde 0.12, all expressed in ozs. per gal. Typical operating conditions, pH 3.7 (quinhydrone electrode) with average current density 40 A per sq. ft. at 140 deg. F. Agitation of the solution is essential and may be produced by means of air. Anodes used contain about 18 per cent. cobalt.

This alloy may be plated directly on brass or steel, or on copper-plated steel. For plating on zinc-base die castings, a 0.0003 in. undercoating of copper should be deposited from a cyanide bath to which Rochelle salts are usually added. Nickel-cobalt deposits are to a large extent used as an undercoat to chromium and also under electro-deposits of silver and gold. Recent research has shown that nickel formate may be substituted for sodium formate with considerably improved results. This also permits of the ammonium sulphate being reduced to a ratio nearer 0.1 oz. per gal., with further improvement in buffing qualities of the final product.

American Practice

A recent review of American practice for nickel plating of die-castings showed in the case of cleaning a wide use for trichlorethylene in a three-stage system used in conjunction with alkaline cleaning. For the acid dip by far the larger percentage used sulphuric acid, varying from 2 to 10 per cent. by volume in concentration. Copper plating solutions preferred contained copper metal concentrations of 1.5 to 2.5 oz. per gal., whilst the free cyanide content ranged from $\frac{1}{4}$ to 1 oz. per gal. Temperatures generally used were from 120 deg. F. to as high as 180 deg. with an average of 140 deg. The current density varied between 20 and 50 A per sq. ft. but this was a variable dependent entirely upon the class of process and the metal condition.

In the case of nickel plating where the process was direct on zinc-alloy die-castings, nickel-sulphate concentrations ranged from 10 to 20 oz. per gal., allowing for a sodium-sulphate range between 10 and 24 oz. per gal. Ammonium chloride and boric acid both varied from 2 to 4 oz. per gal. and the pH value was maintained at an average figure of 5.5. Temperatures in this case were somewhat lower, 80 deg.F. average with a comparatively low current density of 10 to 30 A per sq. ft.

Large-scale Bright Plating

Some idea of the extent to which bright plating is used may be obtained by reference to the automatic equipment installed at the American General Electric works at Ontario, California. It is stated that 4,500 to 5,000 sq. ft. of cast-iron or steel surface for plating passes through the complete cycle every twenty-four hours. The consumption of nickel anodes is as much as 173 lb. per day. Although fully automatic a variable drive enables the nickel plating time to be varied from $7\frac{1}{2}$ to 30 min. The nickel-plating tank, of rubber lined steel, is of 4,000 gal. capacity and contains 11,000 lb. of nickel anodes. The cycle is completed after work is dip rinsed and sprayed by a very efficient dryer first by cold air blast and firally by hot air to dry water out of crevices.

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Magnet Alloy

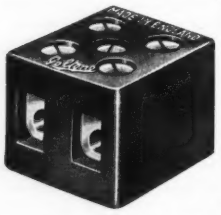
SOME of the metal tape used for sound recording at the New York World's Fair was $\frac{1}{20}$ in. wide and $\frac{1}{500}$ in. thick. It was made of "Vicalloy," which is capable of being rolled and drawn, being intended for the manufacture of permanent magnets. The name is derived from the initial letters of its three constituents, which are 6 to 16 per cent. vanadium, 30 to 52 per cent. iron and 36 to 62 per cent. cobalt. This alloy has been described by Messrs. E. A. Nesbitt & G. A. Kelsall, of the Bell Telephone Laboratories, New York, before the American Physical Society.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Bakelite Wiring Connector

A SAMPLE two-way connector made of moulded bakelite received from WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6, should be an effective alternative to the china type. It is substantially made and can be used in wiring joint boxes for the usual purposes commonly fulfilled by the porcelain variety, with the added advantage that, when desired, the bakelite connector can be screwed into position to act as a terminal for electrical appliances.



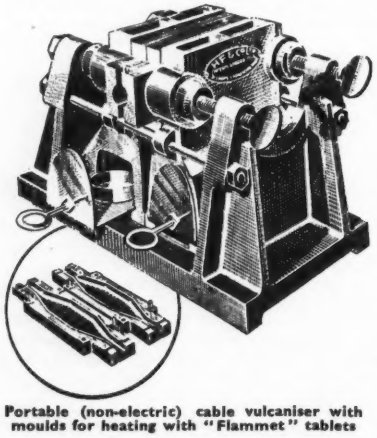
Two-way bakelite wiring connector

Cable Vulcanisers

Convenient vulcanisation devices for the jointing and repair of rubber-covered cables are offered by HARVEY, FROST & Co., LTD., Bishop's Stortford, Herts. Machines are available for use in workshops or outside. The example illustrated is of the latter sort and is entirely portable and self-contained. Various models are obtainable for dealing with cables of different types and sizes, single as well as multicore.

The process itself is based on the same principles as those employed in the manufacture of cable, so that the insulation is said to be permanently restored and the joint rendered impervious to moisture. A single-core joint may be virtually of the same diameter as the cable when re-made in this way.

The portable model weighs 14 lb., measuring 10-in by 8.5-in by 6-in., and is packed in a metal container. The few necessary hand tools are included in the kit, together with specially prepared materials and clear instructions. No special knowledge is needed to operate this machine, which is suitable for cables up to 0.5-in diameter. Heat is provided by solid "Flammet" tablets.

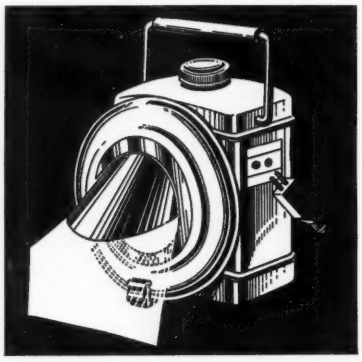


Portable (non-electric) cable vulcaniser with moulds for heating with "Flammet" tablets

For use indoors there is a slightly larger model which is heated electrically by two "Chromalox" elements within the platens; these are independent and insulated from the case frame by uralite. Temperature control is by thermostatic switch operating in a vacuum chamber within solid metal in intimate contact with the vulcanising materials to ensure uniformity. A temperature indicator is fitted and a time switch may be added as an extra, the loading being 0.25 kW for cables up to 1.25-in.

Rechargeable Handlamp

A useful rechargeable handlamp, which is British made, Runbaken patent 10967/40, is announced by ELECTRICAL & AUTO PRODUCTS (1931), LTD., Burton's Building, 71, Oxford Road, Manchester, 1.



"Mastalite" handlamp with built-in battery charger

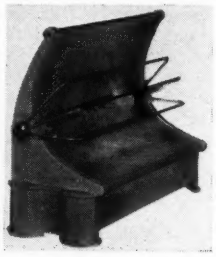
This self-contained "Mastalite" is provided with a "dry" accumulator and a built-in charger that is arranged to be simply plugged into any AC 200/250 V socket outlet. A carrying handle is fitted and the lamp will stand or can be hung from a belt or button.

A rotatable knob at the top serves as a switch and a detachable A.R.P. mask is obtainable. There is also an attachment to enable it to be used as a cycle lamp, with provision for a rear light, in addition to innumerable other uses in the home and workshop.

Electric Fire

An inexpensive electric fire of modern design and solid construction is announced by GRAHAM FARISH, LTD., 153, Masons Hill, Bromley, Kent.

The element is protected by three guard rods radiating from a central chromium boss, giving a pleasing appearance and at the same time minimising interference with the radiated beam. The chromium reflector, which is said to be of true parabolic shape, is mounted in a solid die-cast frame. The element is of long-life nickel-chrome, and is secured by safety connectors, an exclusive feature, and connections are brought out to a three-core flex of generous section.



"Swift" fire with parabolic chromium reflector

This "Swift" model is finished in bronze with chrome fittings and is 11 in. high, 15½ in. long and 5¾ in. wide. It is obtainable in 500/750/1,000 W sizes for 200/220 V and 230/250 V.

Hydraulic Valve Actuation

VALVES of distinctive types intended for the higher pressures associated with mechanisms that are operated by water, or oil, are a speciality of Glenfield & Kennedy Ltd., Kilmarnock, Ayrshire. They include stop, check, relief, reducing and cushioning valves and those used for manipulating such things as cranes, riveters, presses and sluice gates. Ordinary piston and slide and rotary valves packed with moulded leather cups are still being made, but are not recommended for working pressures of more than 1,500 lb per sq. in., whereas the mechanically attractive "Homeyard" design is suitable for test pressures as high as 9,000 lb. per sq. in.

Two spindles respectively acting as pressure and exhaust valves are commonly coupled in equilibrium, having pistons of exactly the same diameter at the top and bottom. Both are kept closed by the continuous downward thrust of a small ram through lever linkage. The outer end of the actuating arm is rounded to slide knuckle-like in a recess formed in an integral cam plate, moving in the opposite direction to the operating lever. Lowering the latter exposes the pressure inlet port and raising it opens the exhaust, whichever spindle remains on its seating for the time being as the fulcrum. Extreme movement of the handle throws the common connecting arm out of the cam-plate recess, so locking the valve in its fully opened position. Directly the handle is moved back sufficiently for the arm to re-enter the cam-plate recess the small ram on the underside of the valve body returns both spindles to their seatings.

These valves in their several forms are made with one port for the control of single-acting cylinders and with two ports for double-acting or pairs of single-acting cylinders working together. They can be arranged for manipulation in sequence or group operation, and are particularly well suited to operation by electro-magnetic solenoids because of the small effort needed. Thus the advantage of remote electrical control of hydraulic plant can be combined with electrical actuation of its valves.

A concrete example is the control of a hydraulically operated sluice valve by means of a 0.5-in. "Homeyard" working at 1,000 lb. per sq. in. Hand levers serve to open the main valve, spring effort being utilised for reversing the connections for closing when released by energising the solenoid retaining gear either by means of a remote push-button, or by a tripping paddle in the main water-flow conduit, or other means. The arrangement can be used as a safety provision to close down hydro-electric power station valves, for instance, in the event of mishaps to pipe lines or generator run-aways, it being possible also to wire the solenoids in the circuit of the turbine overspeed switch.

Another example, in a seamless steel tube mill, of automatic electrical operation controlled by the operation of a machine, is a 2-in. diameter single-acting "Homeyard" made of gunmetal which has twin solenoids. The working pressure is 1,000 lb. per sq. in. and the valve operates 40 times per hour.

COMMERCIAL and INDUSTRIAL NEWS

Prohibited Exports. Battery Price Control. Further Supply Restrictions

Purchase Tax Decisions

SEVERAL decisions relating to liability to Purchase Tax are announced by the Board of Trade. No tax is chargeable on telephones and switchboards, miners' safety lamps and "Rawlplug" sets, but among the articles upon which tax of 33⅓ per cent. is payable are food mixers and ice-cream freezers of capacities up to 12 quarts, and additional attachments for food mixers (e.g., drink mixers and fruit juice extractors).

The B.E.A.M.A. has informed manufacturers of electric heating appliances that the Customs authorities have ruled that tubular heaters are chargeable goods for Purchase Tax purposes, and have indicated that this includes all tubular heaters, irrespective of their intended use. At the same meeting the Customs authorities also confirmed that panel heaters, and all forms of radiators for space heating are chargeable goods.

Lighting Fitting Questions

Acting on the expressed desire of the Government Departments concerned that all questions relating to products affected by the Limitation of Supplies Order and the Purchase Tax should, as far as possible, be dealt with through the appropriate trade associations, it has been agreed that all such questions shall be dealt with through the Electric Light Fittings Association in-so-far as lighting fittings are concerned. The desire is to avoid trouble and loss of time that might otherwise be caused to the Government Departments by individual approaches on these matters.

Apart from firms who are members of the Association it is hoped that non-member fittings manufacturers will address any inquiry they may have on these matters direct to the Association at Kern House, Kingsway, London, W.C.2; they can be assured of prompt attention.

Further Limitation of Supplies

The President of the Board of Trade (Mr. Oliver Lyttelton) stated last week that a new Limitation of Supplies Order was being made to impose further restrictions upon the home consumption of various classes of goods as from December 1st. Most of the articles affected would be of the "luxury" class; there would still be ample supplies of essentials.

The new Order further limits the supply of lighting fittings and domestic hollow-ware (Class 9). So far as aluminium ware is concerned the supply has already been stopped altogether. Other goods in Class 9 are to be restricted to 25 per cent. of the corresponding figure for 1939–40 during the six months to May 31st next. Washboilers are added to Class 17 (Machinery, plant and appliances) which is restricted to 25 per cent.

Refrigator Insulation Manufacturers

The Refrigeration Insulation Manufacturers' Association (R.I.M.A.) has been formed with offices at Kern House, Kingsway, London, W.C.2 (telephone: Holborn 0502). Its principal objects are:— (a) To promote, encourage, foster, develop and protect business in commercial refrigeration insulation and kindred insulated products; (b) to establish and maintain fair and reasonable conditions of sale and distribution; (c) to promote and encourage propaganda by advertisements, exhibitions or otherwise; and (d) to act generally with other kindred bodies and in particular the Commercial Electric Refrigeration Association in furthering the objects of the Association.

The new Association is affiliated to the B.E.A.M.A. and its membership is open to all approved manufacturers in Great Britain of insulation for thermal control who are asked to communicate with the Secretary, Mr. Felix A. Rogers, at the above address, for further information as it is desired to make the new body as fully representative as possible.

The "Henley Telegraph"

It came as a shock to us to be reminded by the Autumn, 1940, issue of the "Henley Telegraph" that that paragon of staff magazines first appeared in 1919 and is consequently celebrating its coming of age. We remember thoroughly enjoying the first number and have since watched it maintaining the high standard then set up. The current issue is, as usual, full of interesting matter—in fact it is an excellent twopennyworth, especially when it is recalled that the "Telegraph" started its career at 6d. a copy. The Henley Research Department has also completed twenty-one years, a fact which is recorded in an appreciative article. Among other things, this issue contains some very good photography.

Maximum Battery Prices

The chairman of the Central Price Regulation Committee has announced the Committee's intention of fixing maximum prices for torch batteries to protect the public from profiteering. He said that it was not possible to rigidly fix all prices. Some allowance would be made in the case of products of British manufacturers who had commenced battery production and whose costs were necessarily somewhat higher than those of established firms. The prices of imported torches would also be greater on account of higher shipping costs, &c.

The following table shows the maximum retail selling price for the various types of batteries:—

—	Larger British mnfrs.	Other British mnfrs.	Imports from U.S.A.	"Burgess" batteries and other Canadian imports	Imports from other countries
Bijou ..	3½d.	4½d.	7d.	5d.	3½d.
Large unit cell or large mono ..	4d.	4½d.	5d.	4½d.	2½d.
Medium or baby single cell or small mono ..	3½d.	3½d.	5d.	4d.	2d.
Fountain pen or "Penlite" single cell ..	2d.	2d.	4d.	3d.	—
Standard flat ..	6d.	7½d.	—	—	—
Large twin cell cycle lamp ..	9d.	10½d.	8d.	6d.	—

Export Control

The Board of Trade has made the Export of Goods (Control) (No. 39) Order, 1940 (Stationery Office, 7d. net). This prohibits or restricts the exportation (save under licence) of articles to certain countries and territories. Among the goods which may not be exported without a licence from the Board of Trade are the following:— Armoured insulated submarine cable of 1 in. or more external diameter; electric carbons of all types; AC and DC generators & generating sets (including rotary convertors and rotary transformers) having an output not less than 150 W and not more than 800 kW; voltmeters and ammeters of a diameter (including the bezel) of 2 in. or more, but not exceeding 2½ in.; magnetos and parts; permanent magnets; thermopiles and thermocouples; wireless valves (other than receiving types) and other electric discharge tubes and parts; X-ray tubes and valves and parts.

Remission of Duty on Steel Tubes

The Import Duties (Exemption) Order (No. 9) made by the Treasury last week exempts from import duty tubes and pipes of iron and steel, other than cast tubes and pipes. The additional duties on certain iron and steel forgings are removed by the Additional Import Duties (No. 10) Order made at the same time.

Charges on Controlled Goods

The Ministry of Supply Control Orders (Exemptions) (No. 1) Order, dated November 5th, permits the charging of controlled materials or articles as security for mortgages, debentures, &c., to "approved persons," i.e., any banker or other person approved in writing by the Minister of Supply. Approved persons are, however, subject to any restrictions relating to the sale or transfer of such goods.

Industrial Supplies Department

The Board of Trade announces that the address of the Industrial Supplies (Registers) Department is now the Carlton Hotel, East Cliff, Bournemouth (telephone: Bournemouth 7210). All future communicatons regarding the Limitation of Supplies (Miscellaneous) Orders, 1940, and the Limitation of Supplies (Woven Textiles) Orders, 1940, should be sent to that address.

Fatalities

A verdict of "Accidental death" was returned at an inquest on John William Jeffery, a school caretaker, at Adwick-le-Street, on November 5th. It was stated in evidence that Jeffery's wife discovered him lying on the floor of the school basement grasping a piece of wire. In trying to move him she received a severe shock. An electrician said that he found some flex hanging from a pipe and the ends were "alive"; the flex appeared to have been torn out of a handlamp. He expressed the opinion that Jeffery had been endeavouring to hang the lamp up or remove it from the pipe when he fell and seized hold of the flex, which had broken. The floor of the basement was damp; the lamp was not faulty.

At Woolwich last week a verdict of "Accidental death" was returned at an inquest upon Patrick Sheehan, who was killed while working in an air-raid shelter. It was stated that he was assisting in the concreting of the shelter, which had become flooded, when he grasped an electric cable and received a fatal shock. Mr. E. W. Martin, borough electrical engineer of Woolwich, said that the Council did not encourage people to install electric lighting in Anderson shelters. Ordinary supply voltage should not be used in these shelters; a transformer could be bought for 10s. or 15s. to reduce the voltage to 20 or 50 which was safe.

The death occurred on September 8th of J. Bibby, an electrical fitter, while working in a sub-station at Plaistow. At an inquest held subsequently at Walthamstow the evidence showed that Bibby was repairing an 11,000-V feeder which should have been isolated. He was doing some work with a file when there was a flash and his clothing burst into flames.

A witness said that the gear had been only partially isolated; an oil switch had been forgotten owing to the stress under which the work was being carried out.

A medical witness stated that Bibby sustained extensive burns and death had been caused by blood poisoning. A verdict of "Accidental death" was recorded.

When two men were charged with housebreaking in London last week it was stated that a third man was concerned but he had since died as the result of a shock from a burglar alarm installed on the roof of the premises into which they were breaking.

Roof Spotting

Classes have now been established for training in roof spotting at over 100 centres in different parts of the country. In order to cover the whole of industry as quickly as possible it is intended to allot vacancies to one representative of each firm desiring training; this representative will then be in a position to train the roof spotting team of his firm. Courses will last five days. Firms should apply to their local A.R.P. Controller, whose address can be obtained from the Town or County Hall or from the local Council Offices. Full particulars of the arrangements will be supplied and vacancies allotted at the earliest possible moment.

Warnings by Radio Relay

A scheme to transmit air-raid warnings over the radio relay network in Burnley has been put forward by Mr. R. Austin, secretary, general manager and engineer of Amalgamated Relays, Ltd. Explaining his proposals to the local Chamber of Commerce recently he said that batteries would be used, enabling the system to operate independently of the town's electricity supply. A resolution recommending the general adoption of the system by manufacturers and other employers in the town was unanimously adopted. Under this system "spotters" specially trained for the work would be posted at scattered points instead of one at each mill.

Ulster Damages Appeal Fails

The Ulster Court of Appeal, by a majority decision, recently upheld the judgment of Mr. Justice Brown in dismissing the action brought on behalf of a twelve-year-old boy, James Joseph M'Laughlin, for damages for personal injury against the Antrim Electricity Supply Co., Donegall House, Donegall Square West, Belfast.

The Lord Chief Justice, in giving his judgment, said he wholly rejected the submission by counsel for the plaintiff that it was immaterial whether the boy (who received injuries as the result of climbing a pylon) was a trespasser or not. Mr. Justice Brown had held that plaintiff was a trespasser and in the Lord Chief Justice's opinion that finding was the only one which would have been justified by the facts. The trial Judge had found that plaintiff was guilty of contributory negligence, and with this he was entirely in agreement.

Lord Justice Murphy said that he agreed with the Lord Chief Justice. In his opinion the finding of contributory negligence was warranted by the evidence. He thought that the warning notice should have been more distinct and that the provision to prevent unauthorised climbing was not adequate.

Lord Justice Babington, in a dissenting judgment, considered that defendants had failed to comply with the regulations governing the erection of high-voltage wires and were guilty of negligence. On the evidence the wire had not been rendered inaccessible and in his view adequate provision had not been made against unauthorised climbing. Defendants were also negligent in not having the warning notice sufficiently distinct. Whether or not the boy was to be regarded as a trespasser, it appeared to him that trespass was immaterial. His Lordship held that plaintiff's right to recover damages had been established, together with costs of the action and of the appeal.

Mr. C. Stewart, for plaintiff, asked for a stay of execution in regard to costs in the event of an appeal to the House of Lords.

Mr. Sheil, for defendants, and in reply to the Lord Chief Justice, said it was not the intention of defendants to levy execution without giving reasonable time for an appeal to be considered.

Lamp Bulb Contract

An action concerning a contract to supply lamp bulbs was heard last week by Mr. Justice Wrottesley in the King's Bench Division. Mr. Jack Zunder, trading as J. Zunder, of Avenue Road, Swiss Cottage, claimed damages against A. & H. Otter, Ltd., of Memel Street, Old Street, London.

Counsel for Mr. Zunder said that he claimed damages as a result of the failure of the defendant company to deliver a quantity of "daylight" bulbs for use in electric torches in pursuance of a contract, oral or written, made in February this year. At the time there was a considerable demand for electric bulbs, particularly the smaller variety.

The defendant company contended that it was a condition of the contract that if they did not receive the bulbs from their manufacturers in Hong Kong they would not be liable to deliver them to Mr. Zunder.

His Lordship found in favour of the plaintiff and awarded him £75 and judgment was entered accordingly with costs.

All-Welded Diesel-Electric Tugs

The Moran Towing and Transportation has awarded contracts for the construction of four all-welded steel tugs to the Pensylvania Shipyards, Beaumont, Texas. This completes a series of twelve Diesel-electric driven tugs for the Moran fleet.

Though smaller in overall length, the vessels will be similar in design to the *Edward J. Moran*, the large floating power house recently commissioned by the company. They will be 93 ft. overall and designed for harbour and coastwise service. The tugs will incorporate improvements based on the experience and observation made during the last five years of the Moran building programme and will be fitted with General Motors Diesel-electric equipment.

Earth Rods and Clamps

In reproducing the photograph of the Type "A" gunmetal clamp in Dr. H. G. Taylor's article published in our last issue we should have given an acknowledgment to W. J. Furse & Co., who have made these clamps for the Copper Development Association.

Flameproof Mining Gear

The customary quarterly list of electrical apparatus (mostly mining, though including some industrial equipment), for which certificates of flameproof enclosure have been granted by the Mines Department during the three months ended September, 1940, has been issued. At the request of the British Electrical & Allied Manufacturers' Association a few copies of these lists are available for sale at the price of 1s. 2½d. each, post free, from the Mines Department, Dean Stanley Street, Millbank, London, S.W.1.

Approved Ships' Stores Dealers

The *Board of Trade Journal* of November 14th contains the names and addresses of about fifty ships' stores dealers who may be supplied without restriction with goods scheduled under the Limitation of Supplies Orders.

Trade Announcements

The General Electric Co., Ltd., has altered the office hours of the staff employed at its headquarters, Magnet House, Kingsway, London, W.C.2. Until November 30th the hours will be from 8.30 a.m. till 4.30 p.m. During the months of December and January they will be from 9 a.m. till 4.30 p.m. From February 1st onwards the present times will be reverted to, viz., 8.30 a.m. till 5 p.m.

The Airedale Electrical & Manufacturing Co., Ltd., announces that from October 24th, the price advance of 20 per cent. on its products is increased to 22½ per cent.

J. A. Crabtree & Co., Ltd., have appointed Masons, Ltd., 2 and 4, St. Vincent Street, Port of Spain, as their agents in Trinidad, British West Indies.

Change of Address

Mek-Elek Engineering, Ltd., has removed to 17, Western Road, Mitcham, Surrey.

New Catalogues and Lists

Simplex Electric Co., Ltd., Broadwell Road, Oldbury, Birmingham.—Leaflet R.R.S. showing advances in the prices of certain products. A list of the company's products subject to the Purchase Tax is also given.

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following, objections to any of which may be entered within one month of November 13th:—

PULLMAN (design). No. 611,890, Class 7 (IV). Electric washing machines; electric machines for cutting bread and vegetables, chopping meat and peeling potatoes; electric sewing machines; sparking plugs and carbon brushes (electrical). No. 611,891, Class 9 (IV). Electric accumulators and batteries, flexibles, bells, buzzers, cigar lighters, coils and coil holders, connections and contact devices, current transformers, door openers, fire alarms, flat irons, switches, resistances, terminals (metal), wireless receiving sets, wireless transmitting apparatus, wireless amplifiers and loud speakers, horns for loud speakers, wireless valves, wireless aerial masts and earthing applicances, television sets, electric foot warmers, vacuum cleaners, carpet cleaners, electric fuse wire, wires for electric transmission, gramophones, gramophone needles, gramophone sound boxes, gramophone tone arms and sound receiving and sound recording apparatus. No. 611,892 Class 11 (IV). Electric cooking stoves, radiators, fans, lamps, lamp bulbs, torches, immersion heaters and refrigeration apparatus. Pullman Electric Co., Ltd., 30 Spring Gardens, Manchester.

EDGWICK. No. 612,420, Class 9 (IV). Apparatus and instruments for testing and measuring materials, and parts of such apparatus and instruments. Alfred Herbert, Ltd., Canal Road, Foleshill, Coventry.

BELMOS. No. 612,932, Class 9 (IV). Electric switches. No. 612,933, Class 11 (IV). Lighting fittings. Thomas Coughtrie, Motherwell Road, Bellshill, Lanarkshire.

NEWS FROM AUSTRALIA

War Material Production—E.T.U. Offer. Sheet-Steel Manufacture

AT a recent meeting of the West Australian branch of the Electrical Trade Union of Australia it was decided to volunteer a portion of the spare time of members for the manufacture of war material. Officials are to ascertain from defence authorities to what extent material can be made available, and what workshops can be provided for the purpose. Mr. B. d'Almeida, secretary of the Perth branch, states that the Kalgoorlie and Wiluna branches have passed similar resolutions, and at Kalgoorlie workshops and material have already been made available.

Shortage of materials is affecting the electrical trade throughout the Commonwealth, and a general slackening off of the building trade is having its effect in the smaller States where it is difficult to place unemployed men in munitions industries. A number of Defence Department contracts have kept some of the larger firms busy. Electrical dealers in country districts are finding things difficult, for most country towns are losing a large proportion of their men (and, of course, their money) through enlistment in the A.I.F. In addition, a bad winter season—particularly in Western Australia—with lack of good rains, has made the farmers' outlook unfavourable, and there is no doubt that poor crops will eventually tighten city money to a great degree. Summer lines are already noted in most stores, and merchants report quite a good winter, with many of the smaller domestic lines moving freely. Manufacturers of the heavier lines (refrigerators, etc.), are faced with a shortage of materials—particularly steel sheets and bars—which are already making things awkward.

Copper Restriction

In view of the increased demand for copper for defence purposes the supply of copper products for the electrical industry from Metal Manufactures, Ltd., Port Kembla, has been considerably restricted. For this reason the company has requested the electrical industry to classify outstanding requisitions for copper products in order that the correct manufacturing sequence can be observed.

The *Electrical Engineer and Merchandiser* states that the classifications are: (a) Defence purposes, which can be supported by authority from the Commonwealth Defence or Supply and Development Departments. (b) Essential services, which can be supported by a statement from the Commonwealth Defence or Supply and Development Departments (e.g., mains to, and earthing for, aerodromes, naval depots, etc.). (c) Relatively important services (e.g., mains to, and earthing for, industrial services). (d) Slightly less important but necessary services (e.g., earthing for domestic electrical installations). (e) Non-essential services, for which substitutes can be obtained (e.g., jointing sleeves).

Manufacture in New South Wales

In the course of his report at the annual meeting of the New South Wales Electrical Manufacturers' Association, the retiring president (Mr. J. P. Tivey) said that the past year had been one of increasing activity and readjustment of production. The electrical manufacturing industry of the State now had 144 productive factories directly employing 7,000 workers. The whole Commonwealth possessed 354 factories engaged in electrical manufacturing industry and employing over 11,000 workers.

The total value of the electrical output of New South Wales in 1938–39 was £4,345,213. The leading item was batteries and accumulators (£976,784), followed by regulating, starting and controlling apparatus (£462,524), transformers and convertors (£298,019), AC motors (£294,441), telegraph and telephone apparatus (£115,481), electric heating appliances (£112,294), household fittings (£51,417), DC motors (including traction) (£36,363), domestic cooking appliances (excluding stoves) (£32,378), and portable tools and appliances (£2,033).

Mr. Tivey said that the war had provided a tremendous spur to increased production of many of these lines as well as of others of particular war-time necessity. The whole of the membership of the Association had pledged itself to place manufacturing and engineering resources at the disposal of the national war effort.

Electrified Sheet-Steel Mill

The method of producing sheet-steel employed at the Port Kembla (Australia) works of Lysaghts Newcastle Works Pty., Ltd., is said to be the only one of its kind in the world. The tandem mill installed, the *Electrical Engineer & Merchandiser* states, comprises seven two-high roll stands with conveyor tables between each. The initial bar, heated to 800 deg. C., is up to 40 in. wide by 8 in. long by 0.375 in. thick, and the final product is 0.06 in. thick. The bar reaches a thickness of 0.125 in. after passing through the first four stands, where it awaits the arrival of two more similar bars; these are then piled automatically on top of one another before going through the following stands. The time interval between bars is 3.5 sec.

The output of this mill is claimed to be 25 tons per hr. compared with 5 tons from the conventional mill, in which the passes of sheet-steel are taken in one or two stands. Each roll stand is driven through gearing by an English Electric 400-HP slip-ring motor. A flywheel on the high-speed shaft with the aid of rotor resistances causes a rolling load of 2,000 HP to create a demand of only 400 kW on the supply system.

For emergency stopping, the supply to the stators is reversed and resistance of a value automatically proportioned to the speed of the motor is inserted in the rotor circuit. The control circuit for this device is fed through a rectifier connected to the slip rings, giving a straight line characteristic of deceleration. Squirrel-cage motors, capable of being started and stopped 1,800 times per hr., drive the conveyors and dog chains between the main stands.

For providing DC required for various purposes throughout the works two English Electric 150-kW synchronous motor generators have been installed. The motors are designed to operate at a leading power factor of 0.37 and an automatic regulator varying the excitation enables the power factor of the whole works to be maintained at any desired value between 0.9 lagging and unity.

Electricity in N.S.W. Collieries

In his annual report for the year 1938, an abstract of which appears in the *Electrical Engineer and Merchandiser*, Mr. A. T. Kirk, the Electrical Inspector of Collieries in New South Wales, states that there were no fatal accidents caused by electricity during the year. There were, however, 11 cases of injury reported under Section 36 of the Coal Mines Regulation Act, due to the use of electricity; eight of these occurred below ground and three on the surface. The total number of collieries with electrical equipment working during the year was 96.

The use of portable electric boring machines is increasing. Up to the present time no serious accident has resulted from their use but the safeguards under the existing Electrical Special Rules are, in the opinion of the chief electrical inspector, inadequate. This equipment, when used on a medium pressure supply, should incorporate some form of safeguard such as sensitive earth leakage protection and continuous earth protection, together with the use of individually screened cables. Still further protection can be obtained if the operators wear rubber boots. Suitable regulations in this regard have been drafted by the Electricity Advisory Committee, and these are now under consideration with a view to their adoption at an early date.

Hydrogen-cooled Alternator

Second Unit for Michigan Power Station

THE new generating station recently inaugurated by Mr. Wendell L. Willkie for the Consumers' Power Co. at Bay City, Michigan, and known as the Weadock station contains a 35,000-kW, 3,600-RPM turbo-alternator. A second similar unit is to be installed within the next few months. The tandem-compound turbine is designed for steam conditions of 800 lb. per sq. in. and 850 deg. F. Eight valves under governor control admit steam to the first-stage nozzles and two overload valves (also governor controlled) admit steam to the first-stage shell. After passing through the eighteen stages of the high-pressure cylinder the steam is passed to the low-pressure cylinder, which consists of three double-flow stages and is enclosed in the exhaust hood and contains the coupling to the generator. Steam is extracted at outlets of the eighth, twelfth, sixteenth and nineteenth stages, corresponding to pressures at full load of 140, 65, 25 and 7 lb. abs.

About 1,100 cu. ft. of hydrogen is required to fill the generator. Purity of gas is maintained by admitting it as required during operation; a positive pressure of 8 in. of water ensures that no air is drawn in. Cooling of the hydrogen is effected by four pin-type sections within the stator frame, two on each side requiring some 360 gal. of cooling water per min. Loss of gas is prevented by oil seals within each bearing, the oil supply to which is independent of the bearing oil supply; gas is reclaimed from the return oil.

Hydrogen cooling is said to increase the efficiency of the generator by more than 1 per cent. at full load and 2 per cent. at half load. Air can be used for cooling, but the output is then limited to 50 per cent. of the rated full-load capacity. Field current for the alternator will be obtained from a 160-kW exciter with a 6-kW pilot exciter driven from the main generator rotor through a two-to-one reduction gear.

ELECTRICITY SUPPLY

Shelter Lighting and Heating. Annual Reports.

Barnstaple.—YEAR'S WORKING.—A net loss of £819 was sustained by the electricity undertaking (engineer, Mr. J. W. D. Cooke) during the year ended March 31st last. This is attributed to the loss of income due to lighting restrictions which was not counterbalanced by the increase of 50 per cent. in the heating and cooking load. The total income was slightly lower at £31,547 and the expenditure rose by about £800 to £19,119, leaving a gross profit of £12,428. Last year there was a net profit of £2,412. The appropriation account still shows a credit balance of £13,179. The sale of energy increased from 3,500,076 to 3,644,511 kWh.

Brighton.—ELECTRICITY TARIFFS.—The electrical engineer and manager has reported to the Electricity Committee that no further revision of tariffs need yet be made.

Cheshire. — HEATERS FOR SIRENS.—To prevent frost interfering with the operation of air-raid sirens the Emergency Committee is to spend £1,030 on fitting them with thermostatically controlled heaters.

Croydon. — ANNUAL ACCOUNTS. — The report of the chief engineer and general manager (Mr. F. N. Rendell-Baker) for the year ended March 31st last shows a decrease in the output from 256 to 255 million kWh; just over half was taken by the Central Electricity Board. The revenue account shows a total income of £583,915 and a surplus carried to the net revenue account of £208,052. The net surplus was £37,831 (against £42,390); of this £15,000 is applied to rate relief and the balance (£22,831) transferred to reserve. Mr. Rendell-Baker says that during the year the reconstruction of the No. 3 turbine to enable it to operate under high-pressure conditions was proceeded with and the set is now in commission. During the year 77 miles of cable were laid and 14 new substations put into commission. The third stage in the construction of the 33-kV north and south ring mains was completed. A new showroom and inquiry office was opened for consumers in the Addington area which was taken over from the County of London Electric Supply Co. on April 1st last year.

Douglas (I.O.M.).—ANNUAL REPORT.—Although the output of the electricity undertaking increased by about 269,000 kWh during the year ended March 31st last the revenue fell from £87,432 to £81,328. There was also a decrease of about £3,000 in expenditure so that the net profit was about £3,000 lower at £29,205. This was insufficient, however, to meet capital charges and it was necessary to take £5,068 from reserve. The capital expenditure during the year was £19,000 less than in 1938-39 (£28,442). Mr. Kelly, the borough electrical engineer, mentions that in the past four years the cost of coal per ton has increased by over 46 per cent.

Fleetwood. — INVESTIGATION OF SITUATION.—At a meeting of the Electricity Committee last week a sub-committee was instructed to investigate the undertaking's financial position with a view to deciding whether it was necessary to increase charges.

King's Lynn.—INCREASED GROSS PROFIT. The accounts of the Electricity Department (engineer, Mr. C. W. Jackson) show that the gross profit for the past year was £23,561, nearly £3,000 more than in 1938-39. The total revenue was £88,830. Although no contribution is made to the rates this year (against £1,100 last year) the higher capital charges reduced the net surplus from £7,798 to £7,329. The sales of energy increased from 18,955,077 to 20,766,829 kWh.

Lancaster.—LOANS.—The Electricity Committee is applying for sanction to borrow £4,348 for mains and services and £1,957 for plant.

London.—ST. PANCRAS.—The Emergency Committee has approved a scheme submitted by the electrical engineer for the internal lighting of surface shelters at a cost of £2,529 and for external traffic warning lights costing £661.

METROPOLITAN COMPANY'S CHARGES.—It was reported at Southall Council recently that a letter had been received from the Electricity Commissioners with regard to the Metropolitan Electric Supply Co.'s charges. The Company had been requested by the Minister of Transport to review the position as soon as possible after the expiration of the first six months during which the increased charges were in force, and the Commissioners had been given to understand that the Company would shortly submit figures showing the actual working results of the undertaking for the six months ended June 30th, 1940.

Manchester.—STREET LIGHTING IN 1939–40.—According to the annual report of the Highways Committee, expenditure on electric street lighting during the year ended March 31st last was £41,777 and on gas street lighting £46,454. The quantity of electricity used decreased from 11,770,442 to 3,180,262 kWh.

Northumberland.—INCREASED C. E. B. RATEABLE VALUE.—The County Council has been informed that as a result of the revaluation of the Central Electricity Board's system the rateable value apportioned to Northumberland has been raised from £1,542 to £3,837, an increase of 149 per cent.

Portsmouth.—COOKERS AT EMERGENCY CENTRES.—The Assistance Committee has arranged for the Electricity Department to install electric cookers at seven emergency centres at a cost of £58.

Surrey.—SHELTER LIGHTING.—The County Council has decided to provide electric lighting and ventilation in school shelters at an estimated cost of £36,550.

Swindon.—INSTALLATIONS IN WARDENS' POSTS.—The Corporation is to have electric lighting installed in 30 air-raid wardens' posts at an estimated cost of £265.

Tunbridge Wells.—LOAN FOR SUBSTATION SWITCHGEAR.—The Electricity Department is applying for sanction to borrow £7,629 for substation switchgear, &c.

Walsall.—PROTECTION AGAINST FROST.—The Emergency Committee is to protect air-raid sirens by electric heating at a cost of £126.

Whitby.—SHELTER HEATING.—The Urban District Council has submitted to the Regional Commissioner for approval plans by the electrical engineer for the heating of public shelters.

Wimbledon.—LIGHTING CONCESSION.—By an arrangement between the Emergency Committee and the Electricity Department, electricity supplied for lighting houses where first-aid repairs have been effected to the windows will be charged for at the normal rate up to the consumption in the corresponding period of last year, and then at the reduced rate of 1½d. per kWh.

Irish Supply Board's Finances

OUR Dublin Correspondent reports that during last week's debate in the Dail on the second stage of the Electricity Supply Amendment Bill (providing an additional loan of £4,000,000 to meet the capital requirements of the Electricity Supply Board up to March 1942) Mr. J. Hughes, Kildare, declared that by the utilisation of electrical power New Zealand farmers "were whipping Irish agriculturists badly." The loan should not be voted unless 10 per cent. of it was ear-marked for rural electrification. There was no sign of this yet, though it was thirteen years since the Board had been set up. While Mr. J. L. Esmonde congratulated the Minister for Industry and Commerce on his vision in introducing this Bill, commenting that the use of peat for generating electricity was an excellent idea, Mr. P. McGilligan said it would be fair to conclude from the Board's report that it did not want the Clonsast scheme at all, and he did not think anyone else could be enthusiastic about it either.

The Minister for Industry and Commerce (Mr. S. MacEntee), in his reply, said that the E.S.B. would be unable to fulfil its statutory obligations to the public unless it was furnished with additional finance and plant. Two erroneous figures had been mentioned in connection with the Bill. He had given the original cost of the Liffey scheme as £503,350 whereas it should have been £760,000, while the revised cost was £1,041,241 and not £784,000. Answering the criticism that the Board had neglected rural electrification, the Minister said that in four years the Board had opened up 95 district areas of supply, bringing the total to 323; well over 200 of these were in villages or small towns with a population of 1,000 or under. The Board had to make ends meet and fix its rates so as to enable it to meet its obligations.

It had always been the Board's policy to maintain a balance between the production of water power and power from steam plants. The Board's aim was to secure the maximum output from the Shannon. It was considered that the next plant extension must be steam driven. One of the senior members had visited stations in Germany and Russia and was satisfied that so far as the utilisation of peat was concerned the problem had been solved. Electricity could be generated as economically from turf as from coal provided that conditions were satisfactory. The Clonsast turf could be delivered at 10s. 6d. per ton. This would cover all the Turf Development Board's expenses. The Turf Board, which had been studying the subject for four years, had visited Continental peat stations accompanied by E.S.B. technicians. The Board could deliver 120,000 tons per year to the Portarlington station.

The Minister, replying to Mr. McGilligan, declared that he had never interfered with the independence of the Electricity Supply Board. No guarantees had been given to the Turf Development Board, but if for reasons completely outside the Board's control its guarantee to the E.S.B. could not be fulfilled, the Government would probably have to make good to the E.S.B. whatever deficiency there might be.

The Bill passed its second stage and the Committee stage was fixed for November 27th.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

676. "Production of electromagnetic oscillations." Board of Trustees of Leland Stanford Junior University. January 22nd, 1938. (528041.)

1059. "Automatic steering gear." General Electric Co., Ltd., and B. Chance. January 12th, 1939. (528174.)

1837. "Rotary air compressors and pumps." T. Scott. January 19th, 1939. (528036.)

1894. "Automatic steering gear for dirigible craft having rudders." General Electric Co., Ltd., and B. Chance. January 19th, 1939. (528037.)

2237. "Electrolytic processes and baths." J. S. Nachtman. January 25th, 1938. (528240.)

4557. "Hydraulically operated brake mechanisms." India-Rubber, Gutta Percha and Telegraph Works Co., Ltd., F. J. Tarris and D. Webb. February 11th, 1939. (528176.)

6266. "Thermionic valve circuits." A.D. Blumlein. February 25th, 1939. (528310.)

8742. "Magneto." J. Bohli. March 21st, 1938. (528039.)

8861. "Alternating current control arrangements." British Thomson-Houston Co., Ltd., A. L. Whiteley and B. G. Higgins. March 20th, 1939. (528247.)

8897. "Electrolytic production of manganese." H. E. Potts (F. W. Atack). March 21st, 1939. (528112).

8977. "Electric welding machines." British Thomson-Houston Co., Ltd. March 21st, 1938. (528044.)

8979. "Starting of gaseous electric-discharge devices such as lamps." British Thomson-Houston Co., Ltd. March 22nd, 1938. (528248.)

9015. "Thermionic valve amplifiers." W.S. Percival. March 22nd, 1939. (528179.)

9069. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and H. R. Ruff. March 22nd, 1939. (528181.)

9164. "Adjustable brackets." General Electric Co., Ltd., and M. W. Peirce. March 23rd, 1939. (528182.)

10358. "Thermostats for operating electric switches." British Thermostat Co., Ltd., and J. E. Sherlock. April 3rd, 1939. (528113.)

11540. "Electric radiators." G. J. Berry and C. A. Painton. April 15th, 1939. (528186.)

11797. "Automatic voltage control by induction regulators." British Thomson-Houston Co., Ltd. April 19th, 1938. (528119.)

11922. "Inking devices for printing mechanism." Westinghouse Brake & Signal Co., Ltd., and M. H. Robinson. April 20th, 1939. (528313.)

11942. "Production of coloured finishes on artificially produced oxide films on light metals." British Anodising Ltd., S. R. Sheppard and J. M. Perfect. April 20th, 1939. (528314.)

12005. "Regulating transformers." Akt.-Ges., Brown, Boveri & Cie. April 29th, 1938. (528057.)

12058. "Suction cleaners," Hoover, Ltd. May 7th, 1938. (528060.)

12064. "Radio direction-finding apparatus." P. W. Willans and Plessey Co., Ltd. April 21st, 1939. (528061.)

12096. "Resistor units and method for making same." G. F. Benkelman. April 21st, 1939. (528066.)

12127. "Discriminating circuits for television and the like." Kolster-Brandes, Ltd., and W. A. Beatty. April 22nd, 1939. (528192.)

12131. "Telecommunication exchange systems." Standard Telephones & Cables Ltd. (L. Kozma). April 22nd, 1939. (528193.)

12175. "Electrical lead wires and their attachment to coupling plugs or other devices." C. R. Cook. April 22nd, 1939. (528195.)

12309. "Electrical condensers." A. H. Hunt, Ltd., and F. L. G. Bettridge. April 24th, 1939. (528318.)

12404. "Air-space high-frequency cables." Standard Telephones & Cables, Ltd., W. K. Weston and D. Nunn. April 25th, 1939. (528323.)

12405. "Control of reversible electric motors particularly for adjusting television receivers." Standard Telephones & Cables, Ltd. (P. A. J. Visschers.) April 25th, 1939. (528324.)

12406. "Control circuits for temperature responsive resistances." Kolster-Brandes, Ltd., and W. A. Beatty. April 25th, 1939. (528325.)

12435. "Railway traffic controlling apparatus." Westinghouse Brake & Signal Co., Ltd., and C. F. D. Venning. April 25th, 1939. (528326.)

12513. "Electric circuit interruptors." Allen West & Co., Ltd., and E. B. Babler. April 26th, 1939. (528197.)

12553. "Frequency selective thermionic valve circuits." R. H. Tanner. April 26th, 1939. (528070.)

12554. "Thermally operated valve cut-off devices." L. J. Fowler. April 26th, 1939. (528071.)

12558. "Method and means for the repair of pipe lines and electric cables." Callender's Cable and Construction Co., Ltd., K. S. Brazier and D. T. Hollingsworth. April 26th, 1939. (528072.)

12559. "Mounting of the chassis of radio and television apparatus or the like." D. Jackson and Pye, Ltd. April 26th, 1939. (528198.)

12561. "Electric water heater." Zip Heaters, Ltd. April 27th, 1938. (528073.)

12573. "Electric battery lamps of the safety or like types." T. A. Hodgkiss and W. E. Smith. April 27th, 1939. (528076.)

12574/12575. "Electric battery lamps." T. A. Hodgkiss and W. E. Smith. April 27th, 1939. (528077/528078.)

12626. "Apparatus for transmitting or receiving coloured television." General Electric Co., Ltd., and L. C. Jesty. April 27th, 1939. (528090.)

12627. "Pumps for producing a flow of conducting liquid." General Electric Co., Ltd., and J. H. Phillips. April 27th, 1939. (428091.)

12628. "Electric switches operated by pulling a cord." General Electric Co., Ltd., and C. G. Eden. April 27th, 1939. (528092.)

12640. "Automatic speed control systems for dynamo-electric machines." British Thomson-Houston Co., Ltd. April 28th, 1938. (528098.)

12641. "Electric control systems and apparatus therefor." British Thomson-Houston Co., Ltd. April 28th, 1938. (528099.)

12665. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. April 28th, 1938. (528105.)

12674. "Sound recording apparatus." Radio Corporation of America. May 28th, 1938. (528127.)

12675. "Film identifying apparatus." Radio Corporation of America. May 28th, 1938. (528128.)

12689. "Electric relay or switching devices for controlling flashing and other intermittent signals." W. Stern. April 27th, 1939. (528132.)

12691. "Phase correcting low pass electric wave filters." Hazeltine Corporation. May 18th, 1938. (528133.)

12692. "Feed-back amplifier filter." Hazeltine Corporation. May 9th, 1938. (528252.)

12713. "Conveyors of the belt type." Mavor & Coulson, Ltd., and J. Thomson. April 28th, 1939. (528137.)

12716. "Quill shaft structures for electric railway vehicles." Westinghouse Electric International Co. April 28th, 1938. (528139.)

12768. "Resinous compositions." British Thomson-Houston Co., Ltd. April 29th, 1938. (528147.)

12783. "Valve amplifying circuits." Standard Telephones & Cables, Ltd. May 28th, 1938. (528151.)

12816. "Vacuum cleaners." Electrolux, Ltd. May 2nd, 1938. (528160.)

12829. "Illuminated signs." G. V. Downer. April 28th, 1939. (528329.)

12835. "Electrical measuring instruments of the thermal type." Sangamo Weston, Ltd. October 27th, 1938. (528199.)

12836. "Electrical measuring instruments of the thermal type." Sangamo Weston, Ltd. August 31st, 1938. (528200.)

12883. "Liquid coating and impregnating compositions." British Thomson-Houston Co., Ltd. April 29th, 1938. (528202.)

12939. "Time controlled switch operating mechanisms." H. Gardner. May 1st, 1939. (528212.)

12941. "Electrical testing device." W. R. Steele. May 1st, 1939. (528213.)

12948. "Non-resonating transformer." A. V. Panov and M. V. Lipkovsky. May 1st, 1939. (528217.)

12989. "Thermionic valves." M-O Valve Co., Ltd., and W. H. Aldous. May 1st, 1939. (528227.)

12991. "Means for obtaining a high voltage DC supply from an inductive saw-tooth oscillator circuit." General Electric Co., Ltd., and W. H. Aldous. May 1st, 1939. (528228.)

12992. "Airtight envelopes of which ceramic materials form part." General Electric Co., Ltd., J. R. Lait and J. H. Partridge. May 1st, 1939. (528229.)

13019. "Steam or like turbines." British Thomson-Houston Co., Ltd. (Shibaura Engineering Works, Ltd.). May 1st, 1939. (528254.)

13107. "Reduction of distortion in electric signal transmission systems." Standard Telephones & Cables, Ltd. May 19th, 1938. (528274.)

13147. "Record chart for automatic recording instruments." G. F. Rayner (J. Rose). May 2nd, 1939. (528279.)

13167. "Electric lamp fittings." Veritys, Ltd., and J. W. Forth. May 3rd, 1939. (528283.)

13215. "Manufacture of electric lamps or discharge devices having vitreous foot-tubes closing vitreous envelopes." General Electric Co., Ltd. November 3rd, 1938. (528291.)

13216. "Electric motor control systems." General Electric Co., Ltd., E. H. Croft and J. C. Turrall. May 3rd, 1939. (528292.)

(*Continued on page* 70).

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

Company Registrations

Bulwark Electrical Co. (Liverpool), Ltd.—Private Co. Registered November 8th. Capital, £5,000. Objects: To acquire the business carried on at Mersey Street, Liverpool, as the Bulwark Electrical Co., and to carry on the business of electrical, mechanical, chemical or civil engineers, electricians, &c. Directors: C. W. Cox, 7, Princes Avenue, West Kirby, Ches., and E. E. Bartlett, 469, Aigburth Road, Liverpool. Secretary: R. F. Albion. Registered office: 12a, Colquitt Street, Liverpool.

Radio Installation Co., Ltd.—Private company. Registered November 11th. Capital, £3,000. Objects: To acquire the business of radio merchants and electrical engineers carried on by J. G. Lougee, G. H. Lougee and G. C. Lougee in Bradford as the Radio Installation Co. Directors: J. G. Lougee, Underwood Drive, Apperley Bridge, Yorks, G. H. Lougee, Waithman House, Apperley Bridge, Yorks, and G. C. Lougee, address not stated. Registered office: Y.M.C.A. Buildings, Forster Square, Bradford.

Companies' Returns

Statements of Capital

South London Electric Supply Corporation, Ltd.—Capital, £750,000 in 50,000 6 per cent. cumulative preference and 700,000 ordinary shares of £1 each. Return dated April 11th, 1940 (filed June 20th, 1940). 30,000 6 per cent. preference and 533,520 ordinary shares taken up. £290,000 paid on 30,000 6 per cent. preference and 260,000 ordinary shares. £273,520 considered as paid on 273,520 shares. Mortgages and charges, £300,000.

Adamson, Green & Co., Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated July 12th. 900 shares taken up. £900 paid. Mortgages and charges, £1,000.

Witton-James, Ltd.—Capital, £6,100 in 2,000 preference and 4,000 ordinary shares of £1 and 2,000 deferred shares of 1s. Return dated August 12th. All shares taken up. £2,000 paid on 2,000 preference shares. £4,100 considered as paid on 4,000 ordinary and 2,000 deferred shares. Mortgages and charges, £25,000.

Power Management, Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1939 (filed August 8th, 1940). All shares taken up. £2,001 4s. paid. (8s. on 4,998 shares and £1 on 2 shares). Mortgages and charges, Nil.

Accumulators of Woking (1928), Ltd.—Capital, £10,000 in £1 shares. Return dated August 7th. 8,501 shares taken up. £4,501 paid. £4,000 considered as paid. Mortgages and charges, £8,000.

Beaconectric, Ltd.—Capital, £5,00 in 1,000 preference and 4,000 ordinary shares of £1. Return dated June 4th. 384 preference and 3,434 ordinary shares taken up. £1,350 paid on 250 preference and 1,100 ordinary shares. £2,468 considered as paid on the remainder. Mortgages and charges, Nil.

British Centralab, Ltd.—Capital, £100 in £1 shares. Return dated May 30th. All shares taken up. £100 paid. Mortgages and charges, Nil.

Mortgages and Charges

Ensign Lamps, Ltd.—Satisfaction in full on October 17th, 1940, of mortgage and charge dated July 22nd, 1940, and registered July 25th, 1940, securing all moneys due or to become due from the company to Midland Bank, Ltd.

Holdgate & Commin (Electrolier), Ltd.—Debenture, charged on the company's property, present and future, including uncalled capital, dated October 18th, 1940, to secure £500. Holder: L. B. Commin, 21, Beechwood Avenue, Chorlton-cum-Hardy, Manchester.

Satisfaction in full on October 18th 1940, of debenture dated August 8th, 1939, and registered August 11th, 1939, securing £400.

Receivers Appointed and Released

Forest Battery Service, Ltd.—G. Ross, of 31, Queen Street, Cardiff, was appointed receiver and manager by Order of Court dated October 7th, 1940.

E. Jeffery, Ltd.—Edmund S. Macfie, of 26, Charing Cross Road, W.C.2, ceased to act as receiver on October 31st, 1940.

Torbay Electric, Ltd.—P. J. Tucker, 121, Mudford Road, Yeovil, ceased to act as receiver and manager on November 1st, 1940.

Liquidations

Goodman & Kelway, Ltd.—Winding-up voluntarily. Liquidator, Mr. C. C. Green, Grosvenor Chambers, Lower Terrace, Torquay.

Inwald Glass Co. (London), Ltd.—Particulars of claims by November 29th to the liquidator, Mr. H. H. Marks, 10, Coleman Street, London, E.C.2.

Radio & Television Service, Ltd.—Meetings under Section 245 of the Companies Act, 1929, on December 11th at 47, Mosley Street, Manchester, to receive an account of the winding-up by the liquidators, Messrs. A. T. Eaves and J. F. Warburton.

Bankruptcies

C. F. A. Henckel, trading as Dawson & Henckel, 42, Grays Inn Road, London, W.C., electrical dealer.—The first meeting of creditors was held on Nov. 13th at London Bankruptcy Buildings. Debtor states that he started business in June, 1932 and attributes his failure to loss of trade since the outbreak of war and bad debts. The liabilities were estimated at £3,500 and the assets at £1,430. The creditors decided to appoint Mr. A. Cripwell, accountant, of London, as trustee of the estate with a committee of inspection.

H. Beaumont, 207, Luck Lane, Paddock, Huddersfield, electrical engineer and radio dealer.—The public examination was held on November 6th at the County Court, Queen Street, Huddersfield. The statement of affairs disclosed ranking liabilities of £935, with assets of £95, leaving a deficiency of £840. The debtor ascribed his failure to loss in connection with a partnership and losses on motor cars and hire-purchase transactions. The hearing was concluded.

K. Bader, electrical equipment manufacturer, lately carrying on business at Westmoreland Road, Hendon, present address unknown.—Public examination December 11th at Bankruptcy Buildings, Carey Street, W.C.2.

Commercial Light, Heat and Power Co., electrical engineers and contractors, 47, Poland Street, London, W.1.—Receiving order made November 1st on a creditor's petition. Public examination November 27th at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. W. Roberts, electrician, 19, Twis Green Lane, Culcheth, Lancs.—Application for discharge to be heard on December 4th, at the Court House, Bolton.

A. J. Davis, wireless dealer and electrician, 15, Bridge Street, Exeter.—Last day for receiving proofs for dividend, November 23rd. Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver.

Private Arrangement

R. Wainwright, electrical factor, Wellington Street, Stockport.—The creditors of the above met on November 8th, when a statement of affairs was submitted showing liabilities of £953, and in addition a building society were fully secured creditors for £620, their security consisting of a charge on property valued at £750. The net assets were £425, leaving a deficiency of £528. It was resolved that the estate should be administered under a deed of assignment to Mr. Sutton, of Sutton & Wild, Stockport, as trustee. A committee of three of the creditors was also appointed.

(*Continued on page 73*)

New Patents (*Concluded from page 69*)**.**

13217. "Electromagnetic clutch and eddy current brakes." M. P. Winther. May 3rd, 1939. (528293.)

13220. "Electromagnetic switches." British Thomson-Houston Co., Ltd. May 3rd, 1938. (Addition to 524816.) (528295.)

13222. "Method of manufacturing selenium rectifiers and photo-electric cells." Suddeutsche Apparate-Fabrik Ges. May 4th, 1938. (528296.)

13232. "Electrical signalling systems." R. J. Halsey. May 3rd, 1939. (528300.)

13313. "Lightning arrestors." Westinghouse Electric International Co. May 6th, 1938. (528332.)

13368. "Piezo-electrically controlled electron discharge tube oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and H. W. Pratley. May 4th, 1939. (528344.)

13369. "Electrical frequency wobbling arrangements." Marconi's Wireless Telegraph Co., Ltd., and B. J. Witt. May 4th, 1939. (528345.)

13370. "Machines for capping electric lamps and the like." General Electric Co., Ltd. August 27th, 1938. (528346.)

13393. "Joint for electric cables." Callender's Cable and Construction Co., Ltd., L. G. Brazier and D. T. Hollingsworth. May 4th, 1939. (528353.)

13401/2. "Television transmitters." Philips Lamps, Ltd. May 7th, 1938. (528354/5.)

13412. "Devices for branching multi-core cables." G. M. Vermeer. May 18th, 1938. (528357.)

13429. "Portable X-ray equipment on motor vehicles." Portable X-rays, Ltd., and J. C. Wilson. May 5th, 1939. (528362.)

15011. "Glands for junction boxes for electric cables." Liverpool Electric Cable Co., Ltd., and R. F. D. Milner. May 19th, 1939. (528311.)

STOCKS AND SHARES

TUESDAY EVENING.

MORE than anything else the demand for ordinary shares in good-class companies stands out as a feature of the Stock Exchange markets. The recent news, more particularly from the Italian theatre of war, has had the effect of inducing a wave of cheerfulness, and, from the more material point of view, of accelerating the flow of capital into Stock Exchange investments. For the moment, the rush for gilt-edged securities, which was so pronounced earlier this month, has been stayed. Prices remain firm, but there is not so much business doing in these, the volume of trade having become diverted into industrial shares and into Home Railway stocks.

Stock Exchange brokers find it extremely difficult to comply with the urgent demands from their clients for lists of stocks and shares that can be obtained to give anything like a living yield on money which seeks employment. When a broker wants to deal in shares of many industrial companies, he is constantly told in the market that there are buyers only. Not infrequently the would-be purchaser is informed that shares can be bought if he, the purchaser, will consent to the bargain being done "Not to press" which means that, if the shares are bought, it may be weeks, if not months, before the shares are delivered.

Home Railways

By this time, the apprehensions of what might be the result of physical damage inflicted upon Home Railway companies by enemy action, have given way to a more cheerful outlook. Prices of Home Railway stocks are going ahead under the genial influence of purchases by people attracted to the stocks by the good returns which can still be obtained from the junior issues. So far as the prior-charge stocks are concerned, these mostly stand at prices which compare fairly closely with others deemed to be in a similar class. The junior stocks, like their seniors, have been in active demand, and at last London Passenger Transport "C" stock has given an indication of vitality by rising a point to 28. The modified agreement between the railway companies and the Government, which is to supersede the present arrangement, has yet to be announced, but there will be grave disappointment if the new scheme does not provide at least as good terms as those under which the railway companies are now operating.

It is a significant sign of the times that the Waterloo and City Railway is now to be kept open during air-raids. Southern 5 per cent. preference at 82½ is four points, and the 5 per cent. preferred at 46½ two, to the good.

Rises in Cable and Wireless

Cable and Wireless stocks are decidedly better, both the 5½ per cent. preference and the ordinary attracting attention by reason of the good yields they offer at the current figures, despite the recent rises. The preference stock, which now stands at 90, has been up to nearly par in the present year and the ordinary, now 53½, stands 31½ points below its best for 1940. It seems a little surprising that the 4 per cent. income debenture stock should be as high as 98½; the reason lies in the fact that nowadays it is extremely difficult to get a 4 per-cent.-redeemable stock at anything under par. Repayment takes place through the operation of a 1 per-cent. sinking fund.

Other stocks and shares in the communication group show comparatively little change, though, as is the case with other industrial shares, they are generally easier to sell than to buy.

Dividend Declarations

Most of the well-known industrial companies are declaring dividends at the same rates as those for the corresponding period last year, and this in itself serves to advertise the attractions of industrial shares. Crabtree Electrical Industries, for instance, which is a holding company, has received sufficient from the operating company to maintain the dividend of 10 per cent. and bonus of 7½ per cent. on the ordinary capital, making, as before, 17½ per cent. for the year. At 20s., the current price of the shares, the yield is 8¾ per cent. Pye, Ltd., the well-known wireless manufacturing company, has declared an interim dividend of 5 per cent. on its 8 per cent. cumulative preferred participating ordinary stock, on account of the year which ends with next March. Last year, the full dividend for the year was 10 per cent., and it seems likely that this will be maintained. Shares changed hands the other day at 21s. 3d. The company's 5s. deferred shares stand at 8s. 9d. On these the dividend last year was 25 per cent. Joseph Lucas final is 12½ per cent., again making 15 per cent. for the twelvemonth.

Electrical Switchgear

Electrical Switchgear is maintaining its 10 per cent. dividend. The price of the shares is about 20s., but there is practically no market in them, the bulk being held by the British Oxygen Company. It may be recalled that six months ago the British Oxygen Company made an offer to acquire the whole of the issued ordinary shares of Electrical Switchgear and Associated Manufacturers, on the basis of one British Oxygen share for every three Electrical Switchgear shares. Acceptances were received from holders of over 85 per cent. of the issued ordinary shares of Electrical Switchgear. British Oxygen stand at 66s. in the market; on this basis Electrical Switchgear should therefore be worth about 22s. Owing to the fact that there is so little market in the latter, the nominal price is called about 20s.

Ericsson Telephones

Ericsson Telephones has reduced its interim dividend from 6 per cent. to 5 per cent., both free of tax. The dividend for the whole of last year was 25 per cent., tax free; and, if the final dividend should also be reduced by 1 per cent., to make 23 per cent. for the year, this would equal 40 per cent. gross, taking tax at 8s. 6d. in the £. At the present price of the stocks —26s. 3d.—the yield, on a basis of 40 per cent. gross dividend, would be £7 12s. 4d. per cent. The company is getting on for forty years old and, since its registration in 1903, the dividend paid each year has been comfortably earned. No doubt the works are fully employed and will probably have plenty to do for many years. It is interesting to note the highest and lowest prices of late. Those for the current year are given in our tables. For the four previous years, they have been as follows:—1936: 63s. 9d and 35s.; 1937: 58s. 9d. and 36. 6d.; 1938: 43s. 9d. and 31s. 3d.; 1939: 43s. and 32s. 3d. The nominal value of the units of stock is 5s.; they were converted from £1 shares five years ago.

Johnson & Phillips

Market anticipations that Johnson & Phillips would declare an interim dividend of 7½ per cent. on the ordinary shares, have been fulfilled. Ultra-cautious folk had looked for a possible cut to 5 per cent., but the present announcement justifies the view that had been taken of the likelihood of a maintenance of last year's rate. It was pointed out here on October 18th that at the then price of 40s., a 15 per-cent. dividend for the year would give, of course, 7½ per cent. on the money; a return which, it was suggested, was "sufficiently generous to warrant absorption of the shares by the buyer of industrials." The buying price now is 45s., and it is taken for granted in the market that, unless very unforeseen happenings occur, the final dividend will be at any rate 7½ per cent. to make once more 15 per cent. for the year. The price of the shares had fallen behind quotations for shares in other companies engaged in similar work, and, in view of the yield offered by shares in the latter undertakings, it is considered not unreasonable to expect further appreciation in the Johnson & Phillips price.

Miscellaneous Matters

The principal rise in the equipment and manufacturing group is one of 7s. 6d. in the shares of International Combustion, which have advanced to 4½ and which, at that price, pay £7 11s. 9d. per cent. on the money. Tube Investments recovered the decline of a week ago and are up again to 83s. 9d. British Aluminium, Hopkinsons, Associated Electrical ordinary and British Thermostat are all ¼ better. Smaller improvements have lifted British Insulated, Callender's, Henley's, Reyrolle, and several others. The prices quoted in our lists, instead of being those at which the investor can reasonably hope to buy shares, will now be found more in favour of possible sellers. Electricity supply shares show a number of gains. Bournemouth and Poole are up by 3s. 9d., County of London by 3s., Northmets by 2s. 6d., and Metropolitans by a florin. Other gains range from 9d. to 1s. 3d.

The improvement has extended to iron, steel and engineering shares. In fact, it is difficult to quote any department concerned with industrial shares that has failed to benefit from the constant pressure to buy the shares of the companies engaged in that particular industry.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price Nov. 18	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	36/6	15	15	42/6	+7/16	—
British Power and Light	30/–	20/–	7	7	25/–	+1/–	5 12 0
City of London	28/–	20/–	7½	7½	21/3	+1/16	—
Clyde Valley	38/6	24/–	8	8	32/6	+1/16	4 18 6
County of London	43/3	21/–	10½	10½	30/–	+3/–	7 0 0
Edmundson's :							
7% Pref.	32/–	24/3	7	7	28/3	..	4 19 1
Ord.	27/6	18/6	9	6	24/–	+1/–	5 0 0
Elec. Dis. Yorkshire	40/3	32/–	9	9	32/6	..	5 10 9
Elec. Fin. and Securities	42/–	34/6	12½	12½	38/9	..	6 9 0
Elec. Supply Corporation	48/–	39/–	12	11½	37/–	..	6 4 4
Isle of Thanet	16/–	5/6	4	4	6/–	..	—
Lancs Light and Power	33/–	21/6	7½	7½	27/–	+1/16	5 11 3
Llanelly Elec.	21/–	17/–	5½	5½	17/–	−9d.	6 9 5
Lond. Assoc. Electric	21,–	12/6	7	5½	13/3	..	—
London Electric	35,–	19/–	8	7	20/–	..	7 0 0
London Power Deb. Red.	105½	100	5	5	100½	..	4 19 6
Metropolitan	41/6	22/6	12	10	30/–	+2/–	6 13 4
Midland Counties	39/–	23/3	8	8	30/9	+1/16	5 4 1
Mid. Elec. Power	40/–	29/6	9	9	32/6	..	5 10 1
Newcastle Elec.	29/9	22/6	7	7	22/6	+6d.	6 7 3
North Eastern Elec. :							
Ordinary	31/6	16/6	7	7	23/9	+1/16	5 18 0
7% Pref.	32/6	25/6	7	7	27/6	..	5 1 10
Northampton	44/–	38/–	10	10	38/9	..	5 3 3
Notting Hill 6% Pref. (£10)	10½	9	6	6	9	..	—
Northmet Power :							
Ordinary	42/3	22/6	10	10	30/–	+1/8	—
6% Pref.	29/–	23/–	6	6	26/–	..	4 12 4
Richmond Elec.	24/6	18/–	7	6	18/9	..	—
Scottish Power	38/–	24/–	8	8	31/3	+1/16	5 2 5
Southern Areas	21/3	12/9	5	5	13,9	..	7 5 6
South London	23/3	20,–	7	7	20/–	..	7 0 0
West Devon	20/–	17/6	5	5	20/–	..	5 0 0
West Glos.	22/–	15/–	2½	4½	16/3	..	5 10 10
Yorkshre Elce.	40/–	23/6	8	8	30/9	..	5 4 1
Overseas Electricity Companies							
Atlas Elec.	4/–	1/3	Nil	Nil	1/9	..	—
Calcutta Elec.	37/–	22/6	10*	8*	30/6	..	5 5 0
Cawnpore Elec.	30/–	24/–	10	10	25/–	..	8 0 0
East African Power	25/6	19/6	7	7	20/–	..	7 0 0
Jerusalem Elec.	24/–	15/–	7	7	16/3	..	8 12 4
Kalgoorlie (10/–)	12/6	9,6	7½	7½	11,–	..	6 16 5
Madras	26/9	21/6	8*	6*	25/–	..	4 16 1
Montreal Power	35½	30	1½	1½	32	..	—
Palestine Elec. "A"	25/–	10/–	5*	Nil	11/3	..	—
Perak Hydro-electric	20/3	13/–	2½	6	15/–	..	8 0 0
Shawinigan Power	27¼	19	83cts.	90cts.	20	..	—
Tokyo Elec. 6%	69	52	6	6	30	..	20 0 0
Victoria Falls Power	75/9	56/6	15	15	67/6	+1/16	4 9 0
Whitehall Investments Pref.	17/9	8/–	7½	7½	10/–	..	15 0 0
Public Boards							
Central Electricity :							
1950–70	110½	104	5	5	105½	..	4 14 8
1955–75	112½	106	5	5	107½	..	4 13 0
1951–73	107½	102	4½	4½	105	+1½	4 5 9
1963–93	96½	90	3½	3½	91	..	3 17 0
London Elec. Trans. Ltd.	92	87½	2½	2½	93	..	2 13 9
London & Home Counties							
1955–75	113¼	105	4½	4½	105½	..	4 5 4
Lond. Passenger Transport :							
A	116	104	4½	4½	107	+1	4 4 0
B	116	102½	5	5	104½	..	4 15 8
C	65½	25	1½	1½	28	+1	5 7 2
West Midland Joint Elec.							
1948–68	106½	103	5	5	105½	..	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	230	176	9	9	200	..	4 10 0
Anglo.-Am. Tel. :							
Pref.	107	85	6	6	96	+2	6 5 0
Def.	23⅜	18	1½	1½	22½	..	6 13 4
Anglo-Portuguese	22/6	10/–	8	8	15/–	..	10 13 4
Cable & Wireless :							
5½% Pref.	99½	66	4½	5½	90	+5	6 2 3
Ord.	65	27	4	4	53½	+2½	7 9 4
Income	99⅜	93	..	..	98½	..	4 1 3
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/6	..	—
Globe Tel. & Tel. :							
Ord.	32/6	21/6	7½*	6*	25/–	..	4 16 0
Pref.	27/9	22/6	6	6	23/9	..	5 1 1
Great Northern Tel. (£10)	20	11	20	20	12½	..	—
Inter. Tel. & Tel.	5½	2½	Nil	Nil	3½	..	—
Marconi-Marine	30/–	18/3	10	7½	20/–	..	7 10 0
Oriental Telephone Ord.	2⅞	45/–	12*	11½*	2⅜	..	4 16 10
Telephone Props.	15/–	11/–	5	6	12/6	..	9 12 0
Telephone Rentals (5/–)	9/6	5/3	10	10	6/6	+3d.	7 13 10

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price Nov. 18	Rise or Fall	Yield £ s. d.
Traction and Transport							
Anglo. Arg. Trams :							
First Pref. (£5)	4/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	11½	2	Nil	Nil	7	..	—
British Electric Traction :							
Def. Ord.	830	400	5	45	750	..	6 4 4
Pref. Ord.	169	130	8	8	140	..	5 14 3
Bristol Trams	48/6	32/6	10	8*	37/6	..	—
Brazil Traction	12¼	5½	$1	50c.	5½	..	—
Calcutta Trams	24/–	16/3	8	5½	19/–	..	5 15 9
Cape Elec. Trams	18/6	16/–	5	5	17/–	..	5 17 8
Lancs Transport	35/–	27/6	10	10	35/–	..	5 14 3
Mexican Light :							
1st Bonds	36	25	5	5	35	..	—
Rio 5% Bonds	95	74	5	5	90	..	5 11 3
Southern Rly. :							
5% Prefd.	79	35	5	5	46½	+2	10 15 0
5% Pref.	104½	59	5	5	82½	+4	6 1 3
T. Tilling	45/9	29/–	10	10	40/–	..	5 0 0
Tilling & B.A.	47/6	41/9	9*	8*	44/6	..	—
West Riding	35/–	25/–	10	10	33/6	+6d.	5 19 5
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/–	15	Nil	14/–	..	—
Assoc. Elec. :							
Ord.	43/3	26/6	10	10	38/9	+2/6	5 3 4
Pref.	36/6	32,3	8	8	35,–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	37/6	..	6 13 4
Babcock & Wilcox	50/–	28/6	10	11	38/3	+9d.	5 15 2
British Aluminium Ord.	56/–	29/–	12½	12½	42/6	+1/8	—
British Insulated Ord.	92/6	67/–	20	20	78/9	+1/16	5 1 8
British Thermostat (5/–)	14/9	6/6	18½	18½	11/3	+1/8	8 4 6
British Vacuum Cleaner (5/–)	12/–	4/9	40	12½	6/3	..	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	3/9	..	—
Callender's	69/–	46/–	15	15	58/9	+1/16	5 2 0
Chloride Elec. Storage	72/6	55/–	15	15	2½	..	5 4 4
Consolidated Signal	72/6	59/–	36½	17	60/–	..	5 13 4
Crabtree (10/–)	24/9	17/6	17½	17½	20/–	..	8 15 0
Crompton Parkinson :							
Ord. (5/–)	20/–	12/–	30	20	15/–	..	6 13 4
E. K. Cole (5/–)	5/–	2/6	10	Nil	4/–	..	—
Elec. & Musical Industries (10/–)	10/3	4/3	5	Nil	8/6	+6d.	—
Electric Construction	36/3	27/6	13½	10	27/6	..	7 5 6
Enfield Cable Ord.	56/–	40/6	25	16½	45/–	..	7 5 5
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	33/9	16/6	10	10	28/3	+9d.	7 1 7
Ensign Lamps (5/–)	15/3	12/6	25	25	15/–	..	8 6 8
Ericsson Tel. (5/–)	39/3	23/–	25*	25*	26/3	+1/16	—
Ever Ready	28/3	16/6	30	40	25/6	..	7 16 10
Falk Stadelmann	18,3	12,6	6	7	13/9	..	10 3 8
Ferranti Pref.	25/–	22/–	7	7	23/9	..	5 18 0
G.E.C. :							
Pref.	32/6	26/–	6½	6½	30/–	..	4 6 8
Ord.	83/3	53/–	20	20	76/3	+1/16	5 5 0
Greenwood & Batley	25/6	20/–	15	15	20/–	..	13 0 0
Hall Telephone (10/–)	18/6	8/9	15	10	10/–	..	10 0 0
Henley's (5/–)	21/6	12,6	20	20	18/9	+1/16	5 6 8
4½% Pref.	21/2	20/6	4½	4½	21/3	..	4 4 8
Hopkinsons	46/9	32/6	12½	15	38/9	+–	7 14 10
India-Rubber Pref.	21/–	19/6	5½	5½	20/–	..	5 10 0
Intl. Combustion	121/3	70/–	32½	32½	4½	+1/8	7 17 9
J. Lucas	60/6	40/–	15	15	48/9	+1/16	6 3 4
Johnson & Phillips	50/9	32/6	12½	15	42/6	..	7 1 2
Lancashire Dynamo	59/9	47/6	25	20	47/6	..	8 8 5
Laurence Scott (5/–)	11/–	6/–	15	15	8/–	..	9 7 6
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	46/6	30/–	13½	10	33/9	..	5 18 6
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	86/9	52/6	20	20	76/3	..	5 5 0
Pye Deferred (5/-)	9/–	6/9	25	25	8/9	..	14 5 8
Revo (10/-)	20/9	11/6	17½	5	17/6	..	2 17 6
Reyrolle	60/6	41/–	12½	12½	46/3	+1/16	5 8 2
Siemens Ord.	23/9	15/6	7½	7½	16/3	..	9 4 8
Strand Elec. (5/–)	2/3	9d.	10	4	1/3	..	16 0 0
S. Smith (1/–)	8/–	3/6	37½	50	7/6	..	6 13 4
Switchgear & Cowans (5/–)	11/9	5/6	20	10	7/–	..	7 2 10
Telegraph Condenser (10/–)	8/9	6/3	5	..	7/6	..	—
Telegraph Construction	42/6	29/–	10	10	32/6	..	6 3 0
Telephone Mfg. (5/–)	9/–	5/–	9	9	6/–	..	7 10 0
Tube Investments	96/9	59/–	23½	23½	83/9	+1/16	5 13 0
Vactric (5/–)	3/6	2/–	4	Nil	2/3	..	—
Vickers (10/–)	22/–	9/6	10	10	14/6	+6d.	6 18 0
Ward & Goldstone (5/–)	19/9	12/6	20	20	12/6	..	8 0 0
Westinghouse Brake	46/–	30/6	17½	10	33/9	..	5 18 6
Walsall Conduits (4/–)	26/6	17/6	55	55	23/9	..	9 5 0
West, Allen (5/–)	7/–	3/–	7½	10	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Ebbw Vale.—November 29th. Electricity Department. H.v. and pilot cables, substation switchgear and transformers. (November 8th.)

Haslingden.—Electrical heating installation in dining-hall at Institution; S. Wilkinson, County Architect, County Offices, Preston.

Lanarkshire.—County Council. Heating and electrical installation at police station and decontamination centre at Rutherglen. County Architect's Department, 34, Albert Street, Motherwell.

New Zealand. — WELLINGTON — Public Works Department. January 14th. Two 3,000-kVA, 11-kV, three-phase, 50-cycle outdoor-type voltage regulating transformers and control equipment. (T.22238/40.)*

December 10th. One 2,250-kVA, 11 kV transformer for the Kiri substation, and two for Winton substation. (T.22551/40.)*

South Africa.—PRETORIA.—Union Tender & Supplies Board. December 12th. Electric light fittings for G.P.O. (T.22426/40.)*

January 4th. Plant at Gasworks, Cottesloe: (a) One 200-kW rotary convertor and associated equipment. Alternatively (b) one 200-kW mercury arc rectifier or (c) two 100-kW mercury arc rectifiers. (d) Equipment for spare power circuit frame. (T. 22424/40.)*

Tynemouth.—Corporation. Installation of an internal telephone system at police buildings, and wireless installation in wards at the Moor Park Hospital.

Wolverhampton. — December 3rd. West Midlands Joint Electricity Authority. High- and low-voltage AC cables and low-voltage DC cables. (November 8th.)

Orders Placed

Barrow-in-Furness. — Electricity Committee. Accepted. 300-kVA transformer (£239).—British Electric Transformer Co.

Bedford.—Electricity Committee. Accepted. Switchgear for twelve months. Metropolitan-Vickers Electrical Co.; Ferguson, Pailin, Ltd.

Cardiff. — Emergency Committee. — Accepted. 34 portable electric lights, 54 adapters and 20 connectors.—G.E.C.

Cheshire.—Emergency Committee. Accepted. Heating installation at Runcorn tunnels (£480).—Mersey Power Co.

Chesterfield.—Cleansing Committee.—Accepted. Electrical equipment for disposal plant (£37).—Electro Magnets, Ltd.

Huddersfield.—Electricity Department. Accepted. One 300-kVA and three 500-kVA transformers.—Metropolitan-Vickers.

Lanarkshire.—County Council. Accepted. Electrical installations at houses at New Monksland.—Neil Thompson.

Littlehampton.—Emergency Committee. Accepted. Installation of anti-freezing apparatus for sirens (£53).—Sussex Electric Supply Co.

Manchester.—Electricity Committee. Accepted. Three water tube boilers.—John Thompson Water Tube Boilers, Ltd. Subcontractors: Boiler plates.—Colvilles, Ltd.; Boiler and superheater tubes.—Stewarts & Lloyds, Ltd. Water wall headers.—Chesterfield Tube Co., Ltd. Valves and fittings.—Hopkinsons, Ltd. Soot blowers.—Clyde Blowers, Ltd. Economisers.—E. Green & Son, Ltd. Fans and air heaters.—J. Howden & Co. (Land), Ltd. Instruments.—Cambridge Instrument Co., Ltd.; Bailey Meters & Controls, Ltd. Water gauge projectors.—C. A. Parsons & Co., Ltd. Smoke indicators.—Radioviser Parent, Ltd. Motors.—Bruce Peebles & Co., Ltd. Switchgear.—Brookhirst Switchgear, Ltd. Lagging.—W. Kenyon & Son, Ltd. Vacuum cleaning plant.—British Vacuum Cleaner & Engineering Co., Ltd. Automatic boiler control.—Jas. Gordon & Co., Ltd. Coal weighers.—Henry Simon, Ltd. Feed water regulators.—Cope's Regulators, Ltd.

Newcastle (Staffs.) — Town Council. Accepted. Laying e.h.v. cable.—Callender's Cable & Construction Co., Ltd.

Northumberland.—County Council. Accepted. Cables (£160).—W. J. S. Richardson & Co.

Runcorn.—U.D.C. Accepted. Wiring and lighting of 206 air-raid shelters (£1,854).—Mersey Power Co.

Smethwick.—Emergency Committee. Accepted. Electrical installation at three wardens' posts.—S.W. & S. Electric Power Co.

Sunderland.—Town Council. Accepted. Rewinding of motors of the bed lifts (necessitated by the change-over in electricity supply) at the municipal hospital (£116).—Etchells, Congdon & Muir, Ltd.

Electrical installation at sub fire station (£55).—F. Reid Ferens & Co. Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-in-Makerfield.—Improvements to pumping station, and new pumping and screening plant for sewerage scheme (£13,000) for U.D.C.; A. K. Dennis, surveyor, Council Offices, Ashton-in-Makerfield.

Bedford.—Day nursery; borough engineer.

Bishop's Stortford.—Communal shelters 108); surveyor, Council Office.

Bridgwater.—Eight public shelters; borough engineer, Town Hall, Bridgwater.

Burnage.—Communal shelter (£3,000); E. A. Newton, architect, Rutherford chambers, Bow Lane, Manchester 2.

Chertsey.—Shelters (thirty-six for 50 persons each), with fittings, &c., for U.D.C.; W. V. Davies, surveyor, Council Offices, Chertsey.

Cookham.—Shelters (£2,269) for R.D.C.; surveyor, 38, High Street, Maidenhead.

Dewsbury.—Twenty-four public shelters; M. H. Forward, borough architect, Town Hall, Dewsbury.

Doncaster.—Domestic shelters (£19,350); F. O. Kirby, borough surveyor, 2, Priory Place, Doncaster.

Durham.—Forty brick communal shelters; R.D.C. surveyor, Byland Lodge, Durham.

Farnworth.—Buildings at fire station, including workshops, garages, and shelter; F. Ashton, borough engineer, Town Hall, Farnworth.

Fulwood.—Communal domestic shelters with provision for bunks for the U.D.C.; W. S. Watkinson, surveyor, Council Offices, Fulwood, near Preston.

Great Harwood.—Works for fancy goods manufacture; Metropolitan Leather Co., Ltd., Bermondsey Street, London, S.E.1.

Guildford.—Deep shelter for 1,000 persons; borough engineer, Municipal Offices, High Street, Guildford.

Hampton.—Rubber shop extensions; Hall & Hall, Ltd.

Lancaster.—Fifteen public shelters, Middleton and Overton, for R.D.C.; surveyor, Council Offices, 5, Dalton Square, Lancaster.

Lanchester (Co. Durham).—Communal shelters (£7,000); R.D.C. surveyor.

Liverpool.—Development of estate, Runcorn; North Western Estates Development, Ltd., 17, Mill Lane, West Derby.

Macclesfield.—Shelter accommodation at Infirmary; H. K. Gwilliam, secretary.

Financial Section (*Continued from page 70*).

Reports and Dividends

The Associated Equipment Co., Ltd., earned a net profit of £196,500 in the year ended September 30th last, as compared with £179,500 for 1938-39. The final dividend of 5 per cent., free of tax, again makes the total distribution for the year 7½ per cent., tax free.

Crabtree Electrical Industries, Ltd., reports that the operating subsidiary, J. A. Crabtree & Co., Ltd., earned a net profit of £84,355 for the year to July 31st last, against £94,816 for 1938-39, and has paid over to the parent company as dividend £75,000, free of tax (against £94,816). The parent company's profits amounted to £73,701 (against £85,000) and it is maintaining the distribution on its ordinary shares at 17½ per cent., including a bonus of 7½ per cent. The balance carried forward is £19,665, against £19,090.

Johnson & Phillips, Ltd., are maintaining their interim dividend at 7½ per cent., less tax.

Pye, Ltd., has declared an interim dividend of 5 per cent., on the 8 per cent. cumulative participating preferred ordinary stock (same).

Ward & Goldstone, Ltd., are again paying an interim ordinary dividend of 10 per cent., less tax.

Anglo-Portuguese Telephone Co., Ltd.—Interim dividend of 3 per cent., as last year.

The Delhi Electric Supply & Traction Co., Ltd., has again declared an interim dividend of 4 per cent. free of tax.

Franco Signs, Ltd., announces that it does not intend to pay any more interim dividends during the period of the war.

Joseph Lucas, Ltd., are maintaining the final ordinary dividend at 12½ per cent., again making 15 per cent., less tax, for the year.

Electrical Switchgear & Associated Manufacturers, Ltd., has declared a first and final dividend on the ordinary shares of 10 per cent. less tax (same) for the year to October 31st.

Maidenhead.—Warehouse; St. Martin Preserving Co., Ltd.

Manchester.—Works extensions; D. Moseley & Sons, Ltd.
Further shelters; city engineer.

Mansfield.—Deep tunnel shelter; Borough Surveyor's Office, Carr Bank, Mansfield.

Morecambe and Heysham.—Communal shelters (£9,964); borough engineer, Town Hall, Marine Road East, Morecambe.

Mountain Ash.—Shelters for 1,000 persons, for U.D.C.; town clerk, Town Hall, Mountain Ash.

Northampton.—Works additions; Express Lift Co., Ltd.

Northumberland.—Communal shelters at Blyth, Gosforth, Longbenton, Newburn, Seaton Valley, Whitley Bay, Ashington and Newbiggin (£14,372); alterations to Newburn report and control centre; and A.R.P. work at another 26 schools; county architect, County Offices, Morpeth.

Peterborough.—Works canteen; G. W. S. Burdett & Co., Ltd.

Preston.—Surface shelters at four sites for 900 persons and at welfare clinics; J. E. Foster, borough surveyor, Town Hall.

Rickmansworth.—Communal shelters; surveyor, Council Offices, 46, High Street.

Salford.—Shelters at Hope Hospital and Ladywell Sanatorium (£9,800); borough surveyor, Town Hall, Bexley Square, Salford, Manchester 3.

Shrewsbury.—Adaptation of portion of Trinity Old Schools as domestic subjects centre; borough engineer, Guildhall, Dogpole, Shrewsbury.

Shropshire.—Shelters at Bishop's Castle, Oswestry and Bridgnorth High Schools and at elementary schools; county architect, 5, Belmont, Shrewsbury.

Smethwick.—Shelters (£6,000); borough engineer.

Southall.—Shelters (£38,300); Grainger & Apthorpe, Percy Bilton, Ltd. and Balls & Partners.

Southsea.—Factory extensions; J. Evans & Sons, Ltd.

Staffordshire.—School shelters at Betley, Coven and Tean, and school buildings at Great Barr; G. C. Lowbridge, county education architect, County Offices, Stafford.

Stourbridge.—140 domestic surface shelters and eight wardens' posts; G. N. Maynard, borough engineer, Council House, Stourbridge.

Stroud.—Underground shelter (200 persons), and two surface shelters (150 and 50 persons) for U.D.C.; F. Foster Langley, surveyor, Council Chambers, High Street, Stroud, Glos.

Sunderland.—Showrooms for Wilkinson & Co. and extensive alterations in Avon Street for Glaholm & Robson, Ltd.; W. & T. R. Milburn, architects, 17, Fawcett Street, Sunderland.
Shelters at the Cherry Knowle Hospital for the Town Council.

Tendring.—Communal shelters at Manningtree for R.D.C.; S. E. Carroll, surveyor, Council Offices, Weeley.

Wallsend.—Canteens, &c., for Cookson's Lead & Antimony Co., Ltd.

Wimbledon.—Thirty communal centres; borough engineer.

Worcestershire. — School shelters (£20,000); county architect.

Workington.—Houses, Salterbeck estate (£59,373); James Leslie & Sons.

York.—Works additions; Rowntree & Co., Ltd.
Shelters at City Mental Hospital; C. J. Minter, city engineer, Guildhall, York.

I.M.E.A. ACTIVITIES

THE November *I.M.E.A. Journal* states that a member of the Association has suggested to the Council that an endeavour should be made to agree to a standard code of conditions for the connection of single-phase welding plants to public mains similar to the recommendations of the I.M.E.A.—B.E.A.M.A. agreement with regard to starting currents for AC motors. He maintains that engineers will agree that these welders form a most undesirable load and are liable to cause disturbance to other consumers in their neighbourhood. In whatever way they are connected they cause considerable out-of-balance loading on three-phase systems and the makers are continually pressing to get larger loads connected.

The War Emergency Committee of the Council, while "somewhat in sympathy" with the writer, is of the opinion that in the present abnormal circumstances the matter is one which could more properly be dealt with by individual undertakers.

A short time ago the Association requested the British Standards Institution to prepare a draft specification for electricity charges. The B.S.I. in reply has intimated that the Electricity Commissioners are prepared to support the proposal in principle, but they feel that the matter should be postponed until after the war and the Council has agreed to the suggestion.

Purchase Tax on Lamps

Dealing with the Purchase Tax, the *Journal* says that with regard to the tax on filament lamps not exceeding 250W, which is 33⅓ per cent. of the wholesale value, a number of meetings have taken place with H.M. Customs and Excise with a view to securing agreement to a more simple means of operating the tax by making it a fixed price per lamp, and also to avoid complications of dealing with fractions of a penny. This endeavour failed, however, the only concession being that for the purpose of the tax the wholesale price could be taken as list price less a percentage, the latter being in whole numbers.

The Commissioners of Customs and Excise have accepted the following:—For Groups I and VIII (general lighting service), list prices less 22 per cent. as wholesale value; Group II (automobile) and flash lamps, less 34 per cent.; Group VI (Christmas tree) and Group V (miners'), less 25 per cent. For convenience of working, the amount of tax chargeable can be taken as 26 per cent. of the list prices for Groups I and VIII lamps; 22 per cent. for Group II and flash lamps; and 25 per cent. for Groups V and VI. The tax is to be calculated on the total of the invoice for each category, any resultant fractions of a penny being ignored.

Difficulties are reported to have arisen between local authorities and public utility undertakings in connection with making good damage caused to highways by enemy action. The Chief Administrative Officer of the London Civil Defence Region has expressed the view that the mere presence of a main or sewer in such a road does not relieve the local authority of the liability to effect repairs. In order that the work of repair shall be quickly and satisfactorily done there should be the closest co-operation between the local authority and the public utility undertaking and the former should do any necessary clearing work to give access to the mains concerned and should also make up the subsoil or foundation to the level of the main or sewer and, after its repair, complete the reinstatement of the highway.

Insurance Against Raid Damage

Members of the Association and the Electricity Commissioners have received copies of the scheme proposed by the Joint Committee of Electricity Supply Associations for facilitating the prompt restoration of buildings, etc., which sustain war damage. No intimation has yet been received from the Commissioners on the matter as, it is stated, they are doubtless awaiting the publication of the recently-announced Government scheme. Members will be communicated with as soon as a definite decision has been arrived at.

Following upon the announcement of the imposition of a levy of 6d. per ton upon coal, primarily to assist coal producers who have lost their export trade, the Conjoint Conference of Public Utility Associations has asked the Mines Department for an assurance that the necessary steps will be taken to ensure that the colliery companies will not use the increase for the purpose of maintaining the profits at the same level as obtained before the collapse of France. It is pointed out that if they did this it would be most unfair and inequitable to the utility undertakings' consumers.

Chimney Smoke Elimination

A NEW method of eliminating smoke from factory chimneys has been patented by one of the research staff of the United States Bureau of Mines, the patent having been assigned to the United States Government. An electro-magnetic vibrator is used at one end of a cylindrical chamber through which the smoke is passed. At the other end of this chamber is a diaphragm which is so adjusted that the sound waves generated by the vibrator, after reflection by the diaphragm, meet one another at the antinodal points, thus creating maximum sound amplification. The smoke is introduced into the chamber through ports placed at the antinodal points, and the effect of the sound waves is to cause the smoke particles to collide and agglomerate and fall to the bottom of the chamber. The apparatus, which is called a sonic flocculator, can equally be applied, it is claimed, to the removal of dust from polluted air.